THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LV. No. 1394.] LONDON, JANUARY 28, 1890. [42ND YEAR. Price 6d.

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MOST EFFECTIVELY AND *ECONOMICALLY RESTORES* LIME WASTES CONTINUOUSLY.

The Patentee having under his several Patents effected a complete solution of the Spent Lime difficulty, most confidently solicits the consideration of the fact by the Engineers and Managers of Gas Companies, Gas Corporations, and other Spent Lime producers. The adoption of these Patents secures the following amongst other advantages, viz.:—1st. Nuisance is avoided, and the utmost convenience and comfort in Gas purification are secured. 2nd. The Lime is recovered at from one-third to one-half the cost of new Lime, or from 5s. 6d. to 7s. 6d. per Ton (depending on extent of works and working charges). 3rd. The Lime is either recovered for Building and Agricultural purposes, or specially and continuously for Gas purification—no limit being assigned to its durability. 4th. Nearly the whole of the valuable sulphur is collected and sold. 5th. By the Patentee's Improved Furnace, breeze or inferior cannel coke only is required as a fuel. The process has been worked for a considerable time by several important Gas Companies and Corporations throughout the Kingdom, and with the most satisfactory results. The Patentee erects, proves, and grants working on very moderate terms.

Further particulars may be had on application to A. F. WILSON, Esq., Assoc. M. Inst. C.E., 12, Walbrook, London, E.C., Agent for London; J. E. FISHER, Esq., Stourbridge, Agent for the rest of England, Wales, and Ireland; or to the Patentee—

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IMPROVED DRY GAS-METERS;

STATION METERS OF ALL SIZES, with PLANED JOINTS;

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And all kinds of Experimental Gas Apparatus.

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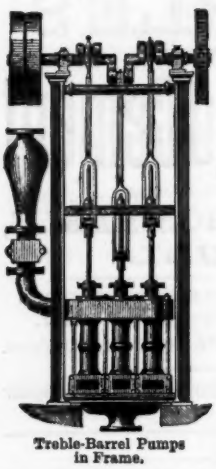
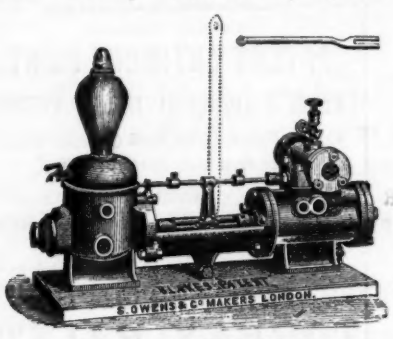
FOR PUMPING TAR, WATER, AND LIQUOR.



Treble-Barrel Pumps in Frame.

Syphon Pump.

Double-Barrel Force-Pump in Frame.



BLAKE'S PATENT **STEAM PUMPS.**

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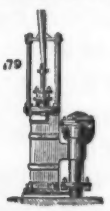

Improved Double Action Pump.

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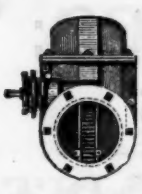
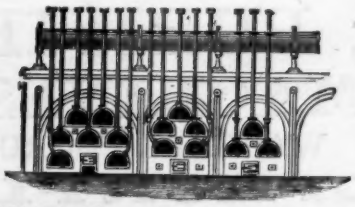
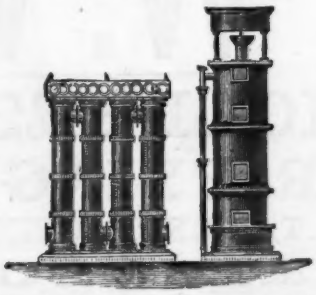
Also Bye-Pass & Stop Valves.







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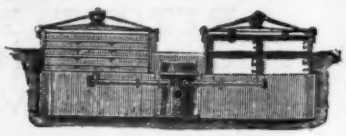

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Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

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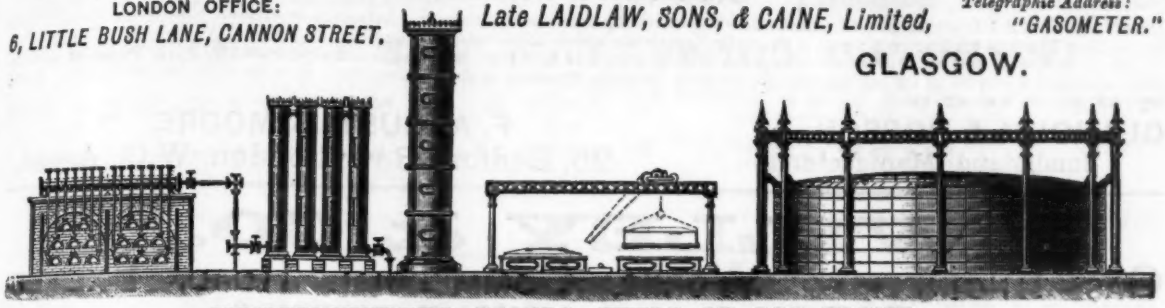

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HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT IRON TANKS;
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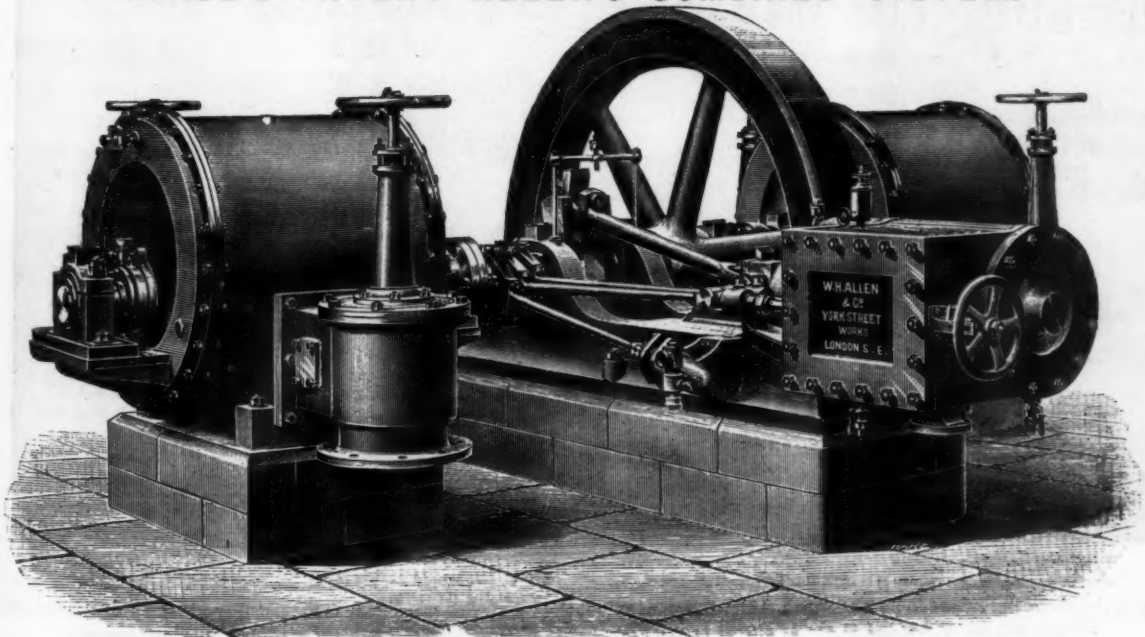

Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

THE "M.P." NOISELESS FLUE EXTRACTOR VENTILATOR.

(ROBSON'S PATENT)

Draws the Foul Air from the Top of a Room into the Chimney in a constant stream. Acts with or without Fire Heat. Can be fixed in existing Flues at trifling cost; and is the *only Ventilator* which accelerates the current of Vitiated Air into the Chimney.

Mr. J. H. Cox, jun. (Manager of the Sunderland Gas-Works), writes: "I have tried many and careful experiments with your Ventilator, and find there is always a current of air passing into the chimney, varying, according to the weather, from 20 to 60 cubic feet per minute. I may say your principle is a sound one."

GLAHOLM & ROBSON,
Sunderland (Manufacturers).

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PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

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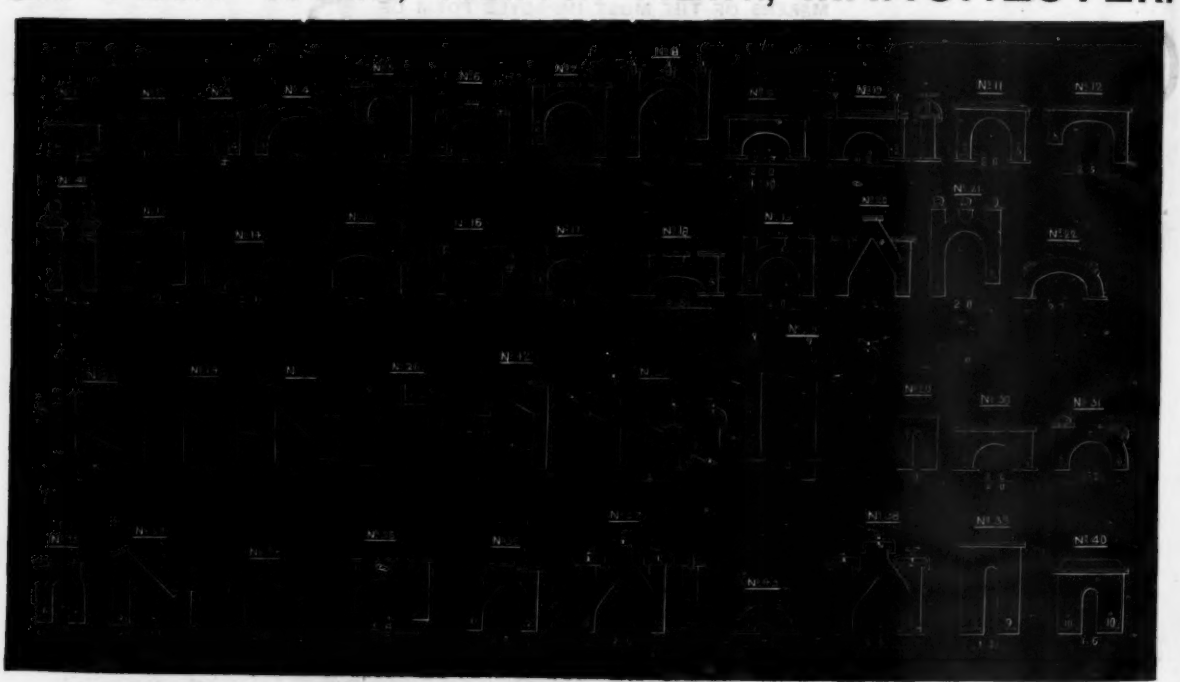
Engineers, Ironfounders, and Contractors,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.



ARCH, BRIDGE, OR H PIPES.

Any of the above patterns can be made with either flange or spigot ends and with faced flanges or turned and bored plugs if required.

Designs Nos. 26, 27, 28, and 42 can be altered to any desired span without extra charge. Other variations by arrangement.

Patterns for special designs or spans made to order.

PATENT GLASS LAMPS & COVERS

For Streets, Railway Platforms, &c., &c.

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This Lamp and Top, being made entirely of Glass, is perfectly impervious to corrosion, and therefore invaluable in Manufacturing and other Towns. The Top can be had in Opal, clear or coloured Glass; and is much cheaper than the old style of metal frames.

Prices on application.

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AND

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MANUFACTURED BY THE

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By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

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OR TO

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NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
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And to the following Gas Companies and Corporations:—

ILKESTON.	BURY.	CHORLEY.
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HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
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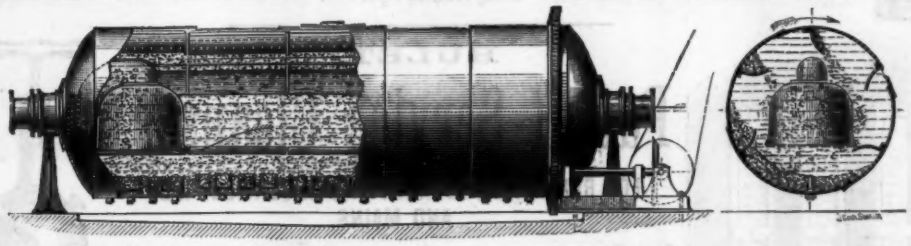
THE REVOLVING PURIFIER

(ANDERSON'S PATENT)

For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

BY AGITATION WITH METALLIC IRON.



MADE IN FOURTEEN SIZES; CAPABLE OF TREATING SINGLY 5000 TO 1¼ MILLION GALLONS PER DAY. REDUCES ORGANIC MATTER FROM 45 TO 90 PER CENT.; TOTALLY REMOVES MICROBES FROM POLLUTED WATER.

GOLD MEDAL, INVENTIONS EXHIBITION, 1885.

Revolving Purifier Company, Limited,

DOCK HOUSE, BILLITER STREET, LONDON, E.C.

D. HULETT & CO., LIMITED,

GAS ENGINEERS,

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MANUFACTURERS OF EVERY DESCRIPTION OF GAS-FITTINGS,

GAS-METERS, GAS-LAMPS, GOVERNORS, ETC.

HIGH-POWER LAMPS

OF THE MOST IMPROVED CONSTRUCTION.

STRONG COPPER TOPS.

PATENT GOVERNOR BURNERS,

Giving from 16 to 450 Candle Power.

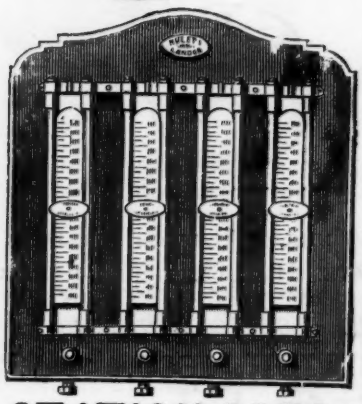
D. HULETT & Co., Limited,

Invite Gas Companies and Local Authorities to compare the Quality of these Lamps with other Makers'.

PATENT STREET LAMPS.

NO PUTTY REQUIRED.

Several thousands of these have been made, and are giving every satisfaction. New Glass can be inserted in a few minutes by any inexperienced person.



HULETT'S

Patent Service Cleanser,

FOR REMOVING OBSTRUCTIONS IN SERVICE-PIPES AND MAINS.

No Gas Company should be without this Valuable Invention.

PATENT STREET LAMP GOVERNORS.

STATION PRESSURE GAUGES, on Enamelled Iron Plates.

WROUGHT AND CAST IRON TUBES AND FITTINGS.

W. & B. COWAN'S DRY METERS.

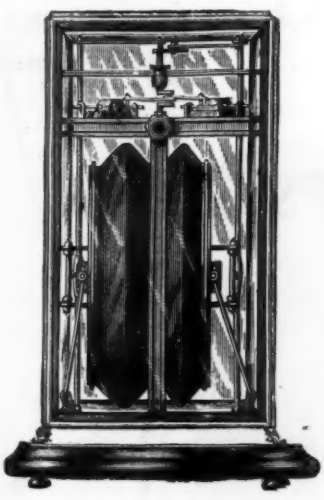
Outside Dimensions.

Size.	Depth, Back to Front.	Height, including Unions.	Width, including Unions.
Lights.	Inches.	Inches.	Inches.
2	7¼	13¾	10
3	8⅝	15	11¼
5	9½	16¾	13
10	10¾	19	15
20	13¼	24½	18½
30	16⅛	27½	21½
50	20¼	33¼	26
60	21	33½	27
80	24¼	40½	31
100	25½	42¼	33¼
150	27¾	50¾	42
200	30	56¾	42¾
250	34¼	58	46¼
300	38¼	63¼	49¼
400	41¾	72¼	56¼
500	46	74	57½

150 Lights and upwards.

Measuring Capacity.

Size.	Bore of Inlet and Outlet.	Per Revolution.	Per Hour.
Lights.	Inches.	Cub. Ft.	Cub. Ft.
2	½	0·083	12
3	⅝	0·125	18
5	¾	0·160	30
10	1	0·3	60
20	1¼	0·5	120
30	1⅜	0·830	180
50	1½	1·428	300
60	1¾	1·6	360
80	2	2·5	480
100	2	2·857	600
150	3	5·0	900
200	3½	6·6	1200
250	3½	7·3	1500
300	4	8·3	1800
400	5	12·0	2400
500	5	14·285	3000



2 to 100 Lights inclusive.

Large Stocks always Ready for Immediate Delivery or for Shipment.

W. & B. COWAN,

ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER, LONDON, S.W. | DUTTON STREET WORKS, MANCHESTER. | BUCCLEUCH STREET WORKS, EDINBURGH.

ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.

London, 1851. New York, 1853. Paris, 1855. London 1862.

Dublin, 1865. Paris, 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

And at 37, BLACKFRIARS STREET, MANCHESTER.

TELEGRAPHIC ADDRESSES: "GOTHIC LONDON," "GOTHIC MANCHESTER." TELEPHONE No. 6725.

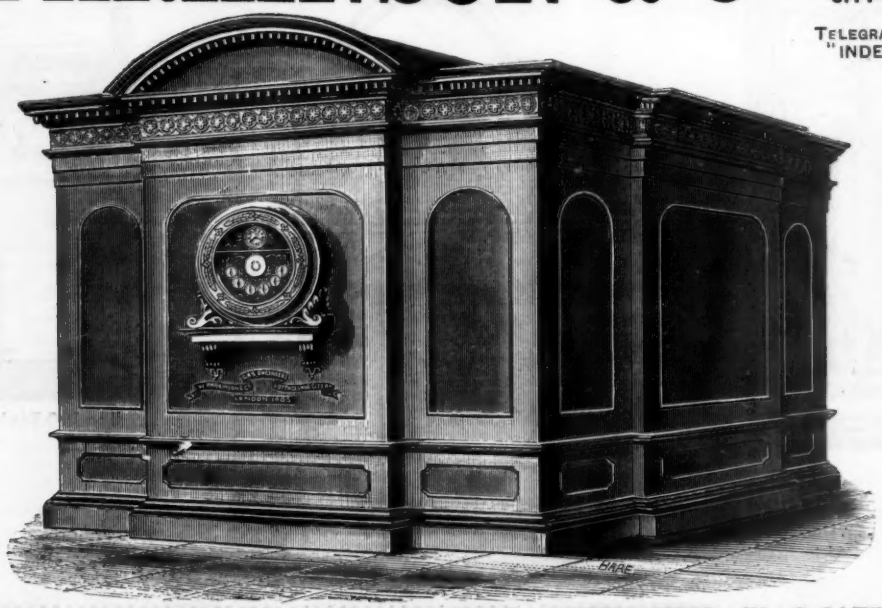
1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by Frost, however severe.
5th—Are the most accurate and unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

W. PARKINSON & Co.,

COTTAGE LANE WORKS, CITY ROAD, LONDON.

TELEGRAPHIC ADDRESS: "INDEX LONDON."



NEW DESIGN STATION METER (No. 2 PATTERN).

W. PARKINSON & CO. have introduced the above design of Station Meter in order to meet the demand for a more ornamental Tank. It is simpler in construction than No. 1 Pattern, and consequently less in cost. All joints are planed, the most modern improvements introduced, and the entire Meter is of the strongest and most substantial description.

FITTED WITH

PARKINSON'S PATENT THREE-PARTITION MEASURING DRUM.

MATERIALS and WORKMANSHIP of the VERY BEST QUALITY ONLY. PRICES, &c., ON APPLICATION

Highest Award, Melbourne Exhibition.

[See also Advt., p. 176.

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NOTICE TO SUBSCRIBERS
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THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 28, 1890.

Mr. G. C. Trewby on Water Gas.

THE very explicit communication of Mr. G. C. Trewby, Chief Engineer of The Gaslight and Coke Company, on the subject of water gas as manufactured for illuminating purposes in America, which appeared in the first number of the JOURNAL for this year, must have been of great interest to our professional readers, as giving the ideas and impressions of the Engineer responsible for the conduct of the greatest coal-carbonizing works in the world, respecting the only gas-making processes proved to be capable of competing on the large scale with coal gas. That Mr. Trewby should have been sent to the United States by his Directors for the purpose of inquiring on the spot into water-gas methods, argued, to begin with, a considerable respect, on his and their parts, for the subject of his investigations. They must have been persuaded that there was "something in it," to use the expressive popular saying, or they would never have taken this step, which was calculated to attract to them and their agent the attention of technicians in all parts of the world. The natural question as to what is to come of this inquiry has not as yet been answered; and we take the present opportunity for discussing the subject of Mr. Trewby's statement, in order to do it justice before Colonel Makins, M.P., the Governor of the Company, supplements it (as he may be expected to do at the approaching general meeting) with a declaration of the views of the Court on the information submitted by their professional adviser. For whatever the Court may think for the present about the matter of water gas, looking at it, as they are bound to do, from the commercial standpoint—whether they find themselves in a position to move in the matter or not—Mr. Trewby deserves to be credited with what he has done towards dissecting the different forms of modern American water-gas apparatus, and subjecting these for the first time to the judgment of an English specialist. Mr. Trewby, it must be understood, is nothing if not a practical gas maker. He has never, to our knowledge, pretended to any remarkable power or originality in the work of gas-works construction since he has been called upon to undertake this responsibility for his Company. As a coal carbonizer on the very largest scale, however, Mr. Trewby has a right to speak with the highest authority; and it was just such a specialist that was needed to ascertain the rights and wrongs, technical and commercial, of water gas as manufactured by American methods. There is no mystery about the generation of water gas, or its preparation for sale. The apparatus is simple, and the method of working equally so. We may assume, without much chance of error, that what Mr. Trewby went to America to find out was not so much how water gas could be made (for plenty of designers of water-gas plant could be found here to tell him that), as what American water-gas companies were actually doing in every sense—what was the direction of the drift of commercial and technical practice in this business, and how far experience gained on one side of the Atlantic with anthracite and local oil would bear translating on the other into terms of coke and imported oil. The result of these inquiries Mr. Trewby has not yet communicated to anybody but his own Directors. He only permits our readers to learn from his observation that, in the phrase we have so repeatedly used, "water gas is a "pretty gas." According to him, it is white, brilliant, and very clean burning; it does not smoke so readily as coal gas; the public like it better; and it retains popular favour, in competition with electricity, better than 16-candle coal gas, whereof the speaker is the largest producer in the universe. If these admissions mean anything at all, they mean that Mr. Trewby is distinctly partial to water gas, and would not object to make it in preference to coal gas if all the conditions favoured the change.

Mr. Trewby shows that he perfectly understands the distinction between the old two-step process and the modern consolidated systems of water-gas production, although he did not fall wholly under the influence of the partizans of the Lowe class of these appliances. Indeed, he inclines to the opinion that the reduction of the process by one stage, which is the special glory of the Lowe principle as compared with that of Tessié du Motay, has been attained by some sacrifice of uniformity of quality in the product; but this conclusion would be contested. Notwithstanding American opinion in favour of the sufficiency of the Lowe method, when modified, as in the Granger-Collins or improved Springer patterns, to deal with crude oil, Mr. Trewby has selected a special form of apparatus, previously unknown by name on this side, wherewith to work out the problem of the use of coke and Russian oil, which he had in his mind, as we have already suggested, before leaving home. The Chartered Company make a great deal of heavy tar oil, not very marketable, which they would be doubtless glad to convert into "cannel gas" for the benefit of Westminster, so far as it would go. The quantity of hydrocarbon required to make any noteworthy proportion of the output of the

Chartered Company would, however, be so much greater than anything to be obtained from the products works at Beckton, that any apparatus intended for serious use must be gauged by its power for dealing with petroleum, and not with tar oils. It remains to be seen whether Mr. Trewby is justified in preferring the Meeze process for this purpose, instead of the more established types of plant. The former reads decidedly more complicated than the generality of water-gas producers; and this is not a recommendation. However, time will show.

The question everybody is asking is precisely what a description of American water-gas methods, such as that given by Mr. Trewby, cannot answer. What we require to know is what Mr. Trewby or anybody else can do in England, with the appliances and materials for water-gas making at his command. How much coke and how much hydrocarbon are required to make the gas according to the standard of an English gas engineer, working under statutory conditions; and what does it cost? This is what Mr. Trewby is preparing to ascertain, by the light of the information gained by him in America last autumn. It is not likely that Colonel Makins will be able as yet to say very much on the commercial side of the question. If he says that the Company are determined to go on experimenting, if necessary, until they know all there is to be learnt about water gas in this country, it will be as much as can be expected. Their interest in the subject may be measured by the extent of their carbonizing operations, which need not be qualified. If water gas is good for anything in England, it is good for The Gaslight and Coke Company; and their Chief Engineer may be depended upon to find out all the good there is in the idea, if his Directors will allow him the necessary scope.

The Stokers' Strike and the Eight-Hour System.

THERE is very little to be said this week about the troubles of the South Metropolitan gas stokers. Mr. Livesey has declared that he does not recognize the existence of a strike—the Company have simply changed their working staff at the men's own desire, and therefore nothing more remains to be said. The long series of deputations and "manifestoes" has come to an end with the determination of the Directors not to receive any more of these formal or informal embassies, seeing that their complaisance in this respect has been construed as a sign of weakness. Mr. Livesey has declared through the newspapers that nothing would induce the Board to discharge any of the new men merely to make room for those who went out of their own accord. It is a remarkable fact that week after week the strikers have deluded themselves with the notion that the Company were "only pretending"—like children at play, and that all of a sudden the old hands would be sent for, and would see their supplanters sent away to their homes. That the new men were really doing the work of gas making, and that the Company meant to keep them for good, is an idea that has never penetrated the intelligence of the average striker. It must be slowly dawning upon him at last, however; and the reflection that his old employers can really do without him is likely to fill him with bitterness against those who have persuaded him to the contrary. The demagogues represented by the *Labour Elector*, who patted the strikers on the back while a chance remained of making useful tools of them, have quietly dropped their cause, and now affect an extreme solicitude for the Eight-Hours law, the "Solidarity of Labour," and other bubbles of fantastic continental Socialism. The officials of the Gas Workers' Union have fallen upon the neck, so to speak, of the Editor of the *Star*, which highly respectable print is, they say, the only newspaper in London that has shown them "fair play"—that is, has supported them through thick and thin, has circulated all their falsehoods and misrepresentations, and treated Mr. George Livesey to all the flowers of Irish-American abusive slang on their behalf. Much good all this has done the poor wretches who gave up their livelihood at the bidding of Messrs. Thorne, Hutchins, and Co. Meanwhile, the works are fast resuming their normal aspect.

A good deal of misrepresentation has been published with regard to the return to the twelve-hour system at the South Metropolitan works; and so it will be desirable to state the facts. When the new hands were first taken on, it was decided, at all the stations except one, to organize the raw gangs temporarily on the twelve-hour system, which would involve only two shifts per day, and allow the men more time between the charges. Also, as the men had to be boarded and lodged, and four put to work as three, the double gang was as much as could be accommodated. It was thought that after a time, as the men became used to the work, the supernumeraries would form the nucleus for the third shift if the eight-hour system was resumed. So long as the men continued to work the full twelve hours, however, they were paid 1s. a day extra—that is, the old hands who struck had 5s. 4d. and 5s. 7d., stokers and scoop drivers, for eight hours, whereas the new men were paid provisionally 6s. 4d. and 6s. 7d. for twelve hours. During the past week or two matters at the different stations have become so far settled that the men were informed that they could make their election for the future between eight hours' work on the old hands' scale of payment, or twelve-hour shifts for the advanced rate. The choice was left entirely to the men themselves; several days being given them to make up their minds, and every opportunity afforded them for getting information from their superior officers. In the event, most of the men chose the twelve-hour shift and the better pay. So far, therefore, the eight-hour movement can hardly be regarded as having succeeded in London in any marked degree. Possibly it was prejudiced by the circumstances of its origin, and cannot be considered as fairly tried upon its merits, seeing that it was always regarded as a sign of the supremacy of the Union. If it had come in naturally, as it did at Liverpool and elsewhere, it might have worked much better. In London, however, Mr. Trewby's complaint has been generally corroborated. There are honourable exceptions, of course; but, as a rule, it is certain that the change from two shifts to three in the day has not benefited the men. As we anticipated when the change was first talked of, it has not conduced to the men's welfare to be turned into the streets of London at something before two o'clock in the afternoon, with nothing to do until six the next morning, and good money every week. The truth of Dr. Watts's lines, "For Satan finds some mischief still for "idle hands to do," has to be reckoned with by those who favour the eight-hour movement. At present, the twelve-hour shift—which, in reality, is hardly more than eleven hours—presenting as it does longer intervals for rest between the charges, and enabling the men to earn more money while preserving them from excessive temptation to spend it, occupies a stronger position than it did six months ago. Of course, the idea of the South Metropolitan stokers being allowed to choose for themselves in this way is treason to the principle of Trades Unionism, which rests on the fundamental assumption that men do not know what is good for themselves, but must be ruled by "delegates." The men have made their choice, however, greatly to their own satisfaction, and have in most cases signed the agreement for profit sharing which makes them permanent employees of the Company.

The North of England Coal Trade.

THE condition of the North of England coal trade is causing some anxiety among manufacturers all over the country. Prices have gone up and wages have risen; but there is the usual difficulty in judging how much of the recent advance is permanent. The half-yearly meetings of the Railway Companies are being held, and at every one the same story of dearer coal is repeated. The miners are reported to be organizing in favour of increased pay and shorter hours; while the employers contend that the wages are already higher than they can afford. At a representative meeting of Durham miners recently held at Chester-le-Street, resolutions were adopted advocating ten hours per day and ten days a fortnight, with an advance of 15 per cent. in wages. This would mean restricting the output of Durham coal by 14,000 tons per day. The men say, as usual, that they only get the most insignificant proportion of the increase in the price of coal which has marked the past few months, and the owners reply that much of the coal raised is sold under contract at old prices, and that the high rates quoted by the men are extreme cases for new business. It is a most unsatisfactory state of things when the consumer only knows that he has to pay a great deal more for his coal, and yet hears that the coal owners and miners, with both of whom he is to some extent in sympathy, are grumbling over a hypothetical profit of which neither admits the possession. If the owners and miners do not get the

increased value paid for the coal consumed, who does? It cannot be the much-abused middleman, for there is no intermediary of the kind in much of the business transacted between consumers and producers of coal. Most railway, steamship, and gas companies prefer to deal direct with the coal owners; and the upward tendency of prices affects these purchasers quite as distinctly, if not to the same extent, as it does those who buy at third hand. The money is paid. It appears on the debit side of an infinity of accounts; and what the community would like to see is the corresponding accounts in which it is a credit entry. These perpetual bickerings between the coal owner and miner are very disappointing; and it is a satire on the Peace Society and other agencies for eliminating war from the relations of diverse nationalities that here at home we seem always to stand on the brink of industrial outbreaks, which are at bottom mere questions of pounds, shillings, and pence. We babble of pacification among the nations; yet we cannot determine a means of keeping miners quiet in the certitude that they are not defrauded by their employers! Charity is evidently not the only public virtue that should begin at home.

The Late Mr. Craig-Sellar and the Reform of Private Bill Procedure.

With the death of Mr. Craig-Sellar the cause of the reform of Private Bill Legislation receives a severe check. It was a cause which the deceased member for the Partick Division of Lanark had made his own by long study and effort; and now he is gone, there does not appear to be anybody to take it up with a like spirit. We have followed the late Mr. Sellar's course in this crusade with much interest, but not with any very lively hope of good resulting from his public-spirited devotion to an essentially dry and repelling subject. A good hobby is a capital thing for a Member of Parliament; but there is all the difference in the world between a sensational fancy, of the "Three Acres and a "Cow" order, and anything so unlikely to strike the public taste as the reform of Private Bill Procedure. It therefore argues a deep conviction of the justice of a cause, as well as a stalwart indifference to public favour, when a member of the Lower House of Parliament identifies himself, as Mr. Craig-Sellar did, with a projected reform which cannot in any way be used to catch popularity and votes. Mr. Sellar was thorough in this matter. He first collected authentic information respecting the cost of Private Bills for industrial purposes; and then set himself to devise some acceptable remedy for this tax upon the energy and capital employed in the industries subjected to special statutes. He tried one idea after another until he arrived at something which seemed to divide his opponents least; but even at the last he was a long way from the realization of his hopes in this respect, and died leaving the work unfinished. Somebody may arise in the course of time to take it up where he left off, and his devotion may, after all, not be wholly wasted; but it is impossible to build upon such a forlorn hope. The point on which Mr. Craig-Sellar (as all other Private Bill Procedure reformers before him) split, was the influence of money-bags in complicating and enhancing the cost of legislative proceedings which might be essentially simple and inexpensive. An unopposed Bill does not cost much as it is; and although a little expense might be saved by simplifying the process of passing it and by reducing House fees, the relief that can possibly be gained in this way is insignificant. On the other hand, the cost of an opposed Bill, as of a defended lawsuit, rises in proportion to the magnitude of the interests involved on either side. It is the interest that exaggerates the cost of legal proceedings, whether before the High Court of Parliament or elsewhere; and this altogether irrespective of the Court fees and formalities. If it had been heard by a County Court Judge, the expenses of obtaining authorization for such a scheme as the Manchester Ship Canal would have been little less than they were. Wherefore, on account of the hopelessness of the matter, and the notorious reluctance of Parliament to undertake any but the most pressing business, we do not expect that Mr. Craig-Sellar's pet scheme of reform in Private Bill Legislation will survive its author, or be heard of in the next parliamentary session.

Title and Index to Vol. LIV.—The title-page and index to Vol. LIV. of the Journal (July to December, 1889) are now ready; and a copy will be forwarded post free by the Publisher, on receipt of a post-card from any subscriber.

WATER AND SANITARY AFFAIRS.

Our columns have lately borne witness to the revival of the lead-poisoning question, in connection with the water supply of Sheffield. It will be seen in our present issue that an agitation of a like nature extends to other parts of the West Riding of Yorkshire, and has given rise to a discussion at the annual meeting of the Yorkshire Branch of the Society of Medical Officers of Health. On the latter occasion a motion was adopted, soliciting an inquiry into the matter at the hands of the Local Government Board. The County Council of the West Riding have passed a similar resolution, asking that the department would direct an immediate and comprehensive inquiry into the subject, in the hope that the result would afford the necessary guidance for the local authorities, and serve as a basis for such legislation as might be found requisite. Among the affected towns, in addition to Sheffield, mention is made of Bradford, Huddersfield, Keighley, Pudsey, and Mirfield. At the last-named place, upwards of forty cases of lead-poisoning from drinking-water are said to have occurred during the last twelve months. In Sheffield as many as 129 cases of this kind are enumerated, extending over the past four years, but chiefly happening within the past two; and it is understood that the total number of sufferers far exceeds that shown by the published list. Only one death is distinctly traceable to the Sheffield water supply, but the injury to health is in many instances very serious; and it is highly probable that the constitution is often so affected as to shorten life. The Sheffield Town Council have determined to engage Professor Dewar, in conjunction with their Consulting Engineer, Mr. Thomas Hawksley, and their Water Engineer, Mr. E. M. Eaton, "to "inquire and report on the tendencies, causes, and "remedies of the Redmires water to take up lead." A general invitation is also given to members of the medical profession and others, to communicate their views on the subject to the Water Committee, and certain gentlemen are specially named as qualified to advise the Committee on the question at issue. The Council already have the benefit of a long and elaborate report from Mr. Eaton, in which he explains some of the peculiarities of the Sheffield water supply, and goes on to propose what he considers will be a remedy for the evil complained of. The subject is not really a new one. Huddersfield made it prominent some time ago; and remedies have been proposed in the past by Dr. Tidy and others. But to this hour there is a want of agreement among the experts; and controversy is keen, both as to the cause and the cure. Yet with regard to the cause, if not the cure, there appears to be a nearer approach to unanimity than existed in 1887, when the Bill of the late Sheffield Water Company was in progress, and evidence was given by opposite parties before a Parliamentary Committee.

At the period just mentioned, the witnesses for the Company contended that the action of the water in taking up lead from the service-pipes was due to a want of silica in the supply. Had there been silica in the water, perhaps the mischief would have been prevented by the deposit of silica on the interior of the pipes; thereby shielding the lead from the action of the water. But why did the lead require the protection of silica? Dr. Sinclair White, when occupying the post of Medical Officer of Health for the borough, declared his conviction that the evil arose, not from the absence of silica, but from the presence of a free acid. To this view most parties seem now to be coming round. Mr. Eaton declares his continued adherence to the theory propounded by Dr. Tidy, "that intimately con-"nected with the action of the Sheffield water was the "absence of silica in solution." This article of faith may still be maintained; but Mr. Eaton proposes to put in practice, as a temporary remedy, the admixture of carbonate of soda with the water supply, concerning which Mr. Alfred H. Allen, the Borough Analyst, says: "The "proposal is a distinct admission on the part of Mr. "Eaton that the cause of the action on lead is an "acid existing in the Redmires water." The treatment with carbonate of soda would add nothing to the proportion of silica, but would neutralize the acid. It is the adoption of a plan worked out some little time ago by Dr. Percy Frankland, who found that the addition of a very small quantity of carbonate of soda to a lead-dissolving water "completely stopped its "action." But this treatment does not coat the pipes with

a silicate; and therefore Mr. Eaton does not propose it as a permanent remedy. He accepts it only as a substitute when occasion may require; his plan being to filter the offending water through limestone and flint. Mr. Allen would have lime or limestone without the flint. Dr. Sinclair White, in 1886, recommended "that the Redmires "water, before distribution, should be brought into contact "with limestone (broken into small fragments) for the space "of fifteen minutes." Mr. Eaton says he has tried this plan, and found the water none the better. Dr. Sinclair White replies that the trial was "an utter farce," and gives reasons for saying so. It is to be hoped that the inquiry about to be set on foot will lead to the adoption of an effective and economical remedy. In the meantime, the people of Sheffield may ask what they are to do with the lead. Are they to have the carbonate of soda?

Sir Robert Rawlinson's paper on the London sewage difficulty, recently read at the Society of Arts, and followed by a discussion extending over two evenings, amounts practically to a revival of the Essex Reclamation Scheme launched by the Hon. William Napier and Colonel Hope in 1865, with the addition of bringing in the southern sewage along with the northern, by means of a tunnel under the river from the Crossness outfall. There is a modification as to the mode of conveying the sewage seaward, and one not altogether commendable. Messrs. Napier and Hope proposed to carry the sewage off by means of a culvert; but Sir Robert contemplates a "new "river," which is to be partly covered and partly open. The sewage is to flow along this channel, a distance of 46 miles, to the shores of the North Sea—that is to say, to the Maplin Sands. Farmers who may care to use the sewage on their land, will be enabled to take a supply from this flowing stream, which is to travel at the rate of two miles an hour; the time consumed after leaving the present outfall or its vicinity being thus 23 hours. There is to be no preliminary precipitation, but sludge and sewage are to go together on their way to the sea. This, or some similar work, is pronounced by Sir Robert to be necessary in order to free the Thames from pollution. Concerning the absence of chemical treatment, we observe that this is not absolute; Sir Robert making the remark that "with fresh sewage flowing over land or to the sea, "very few chemicals need be used, as the land will at once "disinfect it." With respect to the sea, we are told this will "at once dilute and disperse the sewage." But sewage which travels at the rate of two miles an hour from Abbey Mills or Barking, after a journey of several miles from the City and the West-end, will hardly be in a fresh condition by the time it reaches the broad acres twenty or thirty miles below London, to say nothing of a yet greater distance. As for the action of the sea upon sewage, that is not always so satisfactory as Sir R. Rawlinson seems to believe. Sewage irrigation is that in which he has the greatest confidence; and there can be no doubt that this conviction is well warranted. But the difficulty is to "place" the London sewage; and of this obstacle Sir Robert is evidently conscious. He recommends the seaward scheme as saving the river, and as being cheaper than the plan which the County Council has inherited from the Metropolitan Board, which plan he considers will fail. The total cost of his own scheme he puts at £162,000 per annum. But the estimate is based on the calculations of the Main Drainage Referees, made in 1857, when prices were not as they are now, nor the population so large. The cost of the Metropolitan Board plan is reckoned by Sir R. Rawlinson at £300,000 per annum—a figure which Dr. Thudichum reduces by at least one-half. There is a very reasonable plea that the Board's scheme should have a fair trial. We believe that on the northern side, where the outlay has been much the greatest, the works are now virtually complete. If so, they may as well be put in operation. A culvert or canal nearly fifty miles long cannot be made in a year, and the Thames will need next summer whatever benefit the precipitation plan can confer upon it. Unfortunately, there will be only two ships to carry off the sludge; and this will be likely enough to cramp the operations. But the County Council are going to investigate the whole sewage problem as it concerns the Metropolis; and as they seek the guidance of "an eminent civil "engineer" in conjunction with their own, we may expect that chemistry will be at a discount. Perhaps before a decision is arrived at, there will be a new County Council, and a fresh change of front.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 163.)

THE markets have not yet recovered from the depression which the stringency of the Money Market imposed upon them, as the tightness itself is not yet relaxed. The general features remain about the same—viz., no pronounced weakness, only a state of suspended animation. But it is a long lane which has no turning; and signs are not altogether wanting that we are nearing the end of the narrow way into which business operations have recently been compressed. A certain amount of money is always needing investment; and a fair proportion of that sort of business has been effected. The demand which is thus created for high-class investment stocks has been very noticeable during the past week in the Gas Market. An unusual number of transactions in the debenture and preference stocks of the Metropolitan Companies have been marked at much improved prices; and the quotations in general have risen more or less. A fair amount was done in Gaslight "A" at figures which ranged throughout the week between 249 and 251; the closing mark being 249½. As a result, the stock is weaker; the quotation showing a fall of 2. Transactions in South Metropolitan ordinary stock have been limited; but prices are very steady, especially for "B." One transaction only was marked in Commercial old. At the Mart on Wednesday some £2000 odd of this stock was sold at an average price of nearly 243. As by the conditions of sale the vendor is to receive the next dividend, the stock sold is at a disadvantage of nearly 7 as compared with stock purchased in the market. The equivalent price of the latter, therefore, would be about 249¼. The Suburban and Provincial undertakings are again quite without an incident. The Foreign Companies have been very fairly active at very level figures all through the week; not one issue showing any change in quotation. The Water Companies have been extremely quiet; and the only variation is an advance of 1 in New River—bringing the quotation up to 365-370. It is just six years since New River commanded this price. Early in February, 1884, the quotation fell 50, owing to the apprehension produced by the Corporation Water Bill, and the uncertainty as to what course Sir W. Harcourt, then Home Secretary, would pursue; and it has taken the Company six years to recover the old quotation.

The daily operations were: Gas was brisk on Monday, and (with the exception of Gaslight "A," which fell 1) prices were firm. Gaslight 10 per cents. rose 2 to 3. Tuesday was a much quieter day; and figures all round were about the same as the day before. No business was transacted in Water; but New River rose 1. Wednesday showed little increase of animation in Gas; and the only move was in the debenture stocks—South Metropolitan advancing 2, and Gaslight 4 per cent. debenture, 1. There was more activity in Gas on Thursday, especially among secured issues. Of these, Commercial debentures rose 1. Gaslight "A" was weaker; and the quotation had a further relapse of 1. The demand for debenture and preference stocks was well maintained on Friday. Good prices were obtainable; and issues in general were active and firm. Similar characteristics marked the business of Saturday; but quotations underwent no further variation.

ELECTRIC LIGHTING MEMORANDA.

"Industries" on Electrical Engineering in 1889—A Criticism of Messrs. Ferranti and Ince's Defence of High Tension Currents—Professor Robinson on the Cost of Electric Lighting.

A SUMMARY of progress in electrical engineering in 1889 has been published by *Industries*, which, although appearing rather later than one expects of these annual retrospects, may yet be consulted as an independent guide to the subject by those who have learnt to suspect the estimates and prophecies of the regular electrical journals. Our contemporary agrees with us in stating that the past year was a busy one for manufacturing electricians, but expresses a fear lest things have been going ahead a little too fast, especially in connection with central lighting stations. "The public has been asked for, and has perhaps given, a good deal more money than can be very safely invested." The subject of the danger of electric lighting currents is very airily treated by our contemporary; being dismissed as regards this country with the remark that "the rules and regulations" are so strict that "it would be practically impossible to kill any but a most ingeniously suicidal customer." And yet within the past few weeks there has been an outbreak of fire in a West-end mansion served by the Grosvenor Gallery Company due to an "accident" which, if human life instead of house property had been in question, would have made a great deal more noise than it did. The rest of the *Industries* article corroborates our own summary of electric light business for the year. Ship and independent lighting plants for mansions, &c., have been in demand; but very little was done in the way of radical improvement of the system of illumination as a whole.

The defence of high-power alternating currents undertaken for this country by Messrs. Ferranti and Ince, as mentioned in our last issue, has been received by other electricians with many headshakings. It is openly admitted by several experts who

think the present American excitement over the dangers of electric light wires unreasonable, that these spokesmen of the Deptford concern have done the cause harm by their one-sided, although certainly clever statement. The *Electrical Review* writes very contemptuously of the whole article, which it evidently thinks was written to deceive the public. We are not usually suspected of showing too much respect to the assertions and arguments of electrical apologists; but we seldom use with regard to these, such reproaches as "childish nonsense," "ridiculous clap-trap verbiage," and so forth, which are freely applied by our electrical contemporary to Messrs. Ferranti and Ince's composition. As a matter of taste, these flowers of diction are quite superfluous; but in a controversy between persons of the same trade there is seldom much care displayed to select soft words. The whole question is begged by Messrs. Ferranti and Ince when they use the terms "properly constructed," "properly joined," as expressing a necessary condition for the safety of electrical conductors; and their matter-of-course employment of these phrases irritates the editor of the *Electrical Review*, as it does other readers, because it assumes what cannot be conceded. All sorts of processes and manufactures at present regarded as hazardous, and either suppressed by law or carried on in remote places under strict surveillance, would be harmless if only "properly conducted." Dynamite is as innocent a commodity to make and deal in, under conditions theoretically by no means difficult of observance, as dough; but the ever-existent risk of human error makes it a terrible product. So with high-tension electricity. If nothing could ever go wrong with the joints and fittings, it might be possible to think of deadly currents as safely confined in the circuits provided for them. It is the possibility of an outbreak through bad work, which even Messrs. Ferranti and Ince admit, that troubles the public mind, only too familiar, as it is, with breakdowns of the most elaborately designed electrical machinery.

The latest central station electric lighting estimate is that of Professor H. Robinson, prepared for the St. Pancras Vestry, upon which the Vestry have decided to invite tenders. Professor Robinson submitted two schemes, one for 10,000, and the other for 5000 lamps; but the larger has been adopted. It will be noticed from the report (given in another column) that the project is based upon the principle of a continuous-current system, with a potential kept at the safe figure of 110 volts. In order to get over the difficulty of supplying consumers at a distance, closed continuous-current circuits, worked at higher potentials, will be led from the central station to district sub-stations, where the high-tension will be converted into low-tension currents for the local distributing mains. This scheme consequently involves the use of secondary batteries at the district stations. Professor Robinson's report is very clear, and shows that with a 10,000-lamp station the Vestry may expect to be able to generate electrical energy for about 4d. per unit, which is half the maximum price usually asked for by promoters of statutory electric lighting undertakings. This estimate includes everything, according to Professor Robinson, and is supported by provisional tenders for carrying out the work, which would cost about £50,000, or an average of £5 per lamp. This somewhat high figure is due to the use of secondary batteries and to the low-tension system, which entails very costly mains; but if with all this dead weight Professor Robinson can make his electricity for 4d. per unit, he will do better than most electricians. It is curious that, although he charges the energy at the low price of 3½d. per unit, Professor Robinson cannot make a 500-watt arc lamp for street lighting come to less than £38 11s. 4d. for a lighting period of 3808 hours per annum. How can speculators afford to sell the same thing to local authorities for so much less? for we believe that scarcely a street arc lamp in the kingdom is charged at so high a rate. Professor Robinson claims that one of these arc lamps would replace five gas-lamps in the streets of St. Pancras, already one of the gloomiest quarters of London. The expense would be nearly three times that of the gas lighting; but the Professor repeats the old delusion about the great increase in the amount of light. The St. Pancras Vestry would understand this part of the subject better if Professor Robinson would kindly illustrate it by referring to the street watering service. He might say: "The watering-vans at present distribute so many gallons of water yearly over the whole surface of the roadways at a certain cost. For three times the money you might have fountains at intervals of a couple of hundred yards or so, the overflow of which would wash the paths and roadways much cleaner at these spots than anything you have at present." If an unusually dense and unprogressive vestryman were to object that the alteration would not be an improvement from his point of view, as he happened to live midway between two fountains, and would not get even the feeble sprinkling that previously laid the dust before his house, such a person could be silenced by showing how much more water than they could possibly want his neighbours opposite the fountains would get. This illustration would explain to the meanest vestryman the whole philosophy of street lighting by arc lamps.

New Gas and Water Companies were started last year which proposed to raise capital to the extent of £2,714,000. According to the *Investors' Guardian*, the greater portion of this amount (£1,975,500) came into the first six months.

GAS AND LIGHTING BILLS FOR 1890.

In accordance with our usual custom, we are to-day giving an abstract of the projects relating to gas supply which await the consideration of Parliament during the ensuing session; and with these we propose to include the few Electric Lighting Bills which are submitted independently of the Electric Lighting Act.

There are only three Gas Companies desiring incorporation by Bill. These are as follows:—The Falmouth Gas Bill is to incorporate a Company constituted in 1866 for the purpose of purchasing the gas-works then supplying Falmouth. The capital of the Company was £12,000 in £1 shares, all paid up; and there is no mortgage debt. The works have been improved from time to time out of revenue, and are now worth (by valuation) £15,000. The Company desire to increase their capital to £20,000, being the original capital of £12,000, with £3000 added as 5 per cent. improvement capital, and £5000 of new stock. Power is desired to borrow £3750 on the original, and one-fourth of the amount of the new capital. An initial price of 5s. per 1000 cubic feet is asked for 15-candle gas. The Partick, Hillhead, and Maryhill Gas and Electricity Supply Bill is to incorporate a Limited Company formed in 1871 for supplying as within the burghs named, in the suburbs of Glasgow. The present share capital of the Company consists of £130,000, all paid up; and there is a debenture debt of £35,490. The Company are authorized to issue perpetual debenture stock to an amount not exceeding £100,000, for the purpose of paying off the said debenture debts and for the general purposes of the Company, of which stock £23,000 has been issued and paid up. The Company also seek to have their district defined as between themselves and the Corporation of Glasgow; and are desirous of being permitted to supply electric lighting in addition to engaging in the ordinary business of a gas company. The capital of the new Company is to be £200,000, divided into £170,000 of ordinary and £30,000 of preference capital. Of this amount £100,000 of ordinary and all the preference capital constitute the original, and the remaining £70,000 of ordinary capital is to be the additional capital to be raised under the Act. Power is sought to borrow £65,000, inclusive of the debt already incurred, in respect of the original, and £35,000 in respect of the additional capital. The Directors desire facillties for the establishment of a contingency fund out of divisible profits, to be separate and distinct from the reserve fund allowed in Section 31 of the Gas-Works Clauses Act, 1847, and to be applicable for equalizing dividends or for any other purpose. Power is asked for the creation of debenture stock to the amount of £100,000, of which the 4 per cent. debenture stock of the Limited Company already issued is to form part. The standard price for gas asked for is 3s. per 1000 cubic feet; the quality being 20 candles for gas supplied by the Company for illuminating purposes. The powers of supply of the Glasgow Corporation within the district claimed by the Company are to be abolished, and the Company are to purchase all distributing plant so rendered useless to the Corporation, both parties having equal rights against each other for the enforcement of the provisions of the Act. The provisions relating to electric lighting form a separate part of the Bill. The accounts of this contemplated branch of the Company's business are to be kept separate from the rest. The general provisions of the Bill do not differ in any essential from the model; the principal point of interest for the locality affected being the district scheduled to be supplied within two years. The charge for energy supplied is to be at the maximum rate of 8d. per unit, with a minimum of 13s. 4d. per quarter. There is no indication in the Bill of the character of the contemplated electrical undertaking. The Whitehaven Gas Bill is to incorporate a Limited Company formed in 1884 for the purpose of acquiring the existing gas-works at Whitehaven. The present capital of the Company consists of £60,000, half of which is in "A" shares, fully paid up, and the rest in "B" shares, all issued and subscribed and with £7500 paid up. Moreover, the Company have borrowed £15,000 on debentures. Part of the land occupied by the Company is leasehold; and they desire to purchase it in fee. The capital of the incorporated Company is to be £80,000, whereof £60,000 is to be original and £20,000 to be called additional capital, with power to borrow £15,000 on the original and one-fourth part of the amount of the additional capital issued. Clauses are inserted authorizing the Directors to appoint and pay all officers except the Auditor; and declaring that no person shall be disqualified from being a Director by reason of being an officer or being interested in any contract with the Company, providing that he does not vote on any question in which he would be interested as a contractor or officer. If the Manager, Secretary, Solicitor, or other officer of the Company should be a Director, he is not to be subject to re-election to the latter office. The maximum price of 5s. per 1000 cubic feet is stated for 14-candle gas. A clause provides for the Company engaging in electric lighting, without restriction as to capital; and another authorizes the sale of the undertaking with the consent of not less than three-fourths in value of the shareholders convened in special meeting for the purpose.

The Canterbury Gas and Water Bill is to extend the limits of gas supply and increase the Company's holding in land, with power to make a railway siding. New "A" gas shares or stock to the amount of £50,000 are to be issued, to bear an 8 per cent. dividend in common with the other stocks and shares of the

Company. Power is desired to borrow one-fourth of the amount of new capital raised. Certain provisions of the Company's Act of 1866, specially relating to the testing of gas by ten consumers, &c., are to be repealed. Ordinary meetings are to be held yearly instead of half-yearly, and the books are to be balanced at the end of the year. The initial price for 15-candle gas is to be 3s. 6d. per 1000 cubic feet within a radius of 2640 yards from the Guildhall in the City of Canterbury, and 4s. per 1000 cubic feet beyond. The test for purity of gas shall be as provided by the Act of 1871, except that the result is to be the average of three separate results obtained within any calendar month at intervals of not less than three days. The period of error in defective meters is to be restricted to the current quarter. No person is to connect or disconnect a meter through which the Company are expected to supply gas, under a penalty of 40s. Permission is sought to apply for an Electric Lighting Order. The Clayton, Allerton, and Thornton Gas Bill is to enable the Company to raise £50,000 additional capital, to carry a 6 per cent. dividend if issued as ordinary, and 5 per cent. if issued as preference capital, with power to borrow one-fourth of the amount subscribed. Additional land is wanted; and the Bill contains the usual provisions of modern Gas Acts. The Derby Gas Bill is to enable the Company to raise £160,000 of additional capital to bear a 5 per cent. dividend whether issued as ordinary or preference capital, with power to borrow £40,000. The Company also desire to make certain railways and road diversions, and to acquire additional lands. The Gravesend and Milton Gas Bill is to extend the Company's limit of supply, and to enable them to raise £35,000 of 7½ per cent. additional capital, with power to borrow one-fourth of the amount raised. The books of the Company are to be balanced to June 30. The initial price for 15-candle gas is to be 3s. 6d. per 1000 cubic feet within a radius of 2900 yards from the Gravesend Town Hall, and 4s. beyond. The period of error of defective meters is restricted to the current quarter, and persons connecting or disconnecting consumers' meters are to give three days' notice under a penalty of 40s. Permission is requested to apply for an Electric Lighting Order. The Hartlepool Gas and Water Bill is to enable the Company to acquire certain lands within three years for the purposes of their undertaking, closing at the same time a certain footpath. The Luton Gas Bill is to authorize the Company to raise £40,000 of new capital bearing 7 per cent. dividends, with power to borrow one-fourth of the amount. The initial price of 15-candle gas is to be 3s. 9d. per 1000 cubic feet. The Company will engage to pay 5 per cent. interest on deposits. The Company claim to have spent upon permanent works sums out of revenue amounting to upwards of £19,800, of which they propose to convert £17,735 into class "D" shares, bearing 4 per cent. fixed perpetual preferential dividends. The Ystrad Gas and Water Bill is to enable the Company to raise £90,000 of additional 7 per cent. capital, and to borrow one-fourth of this amount. The gas and water accounts are to be separated, and additional gas lands are to be acquired.

The Oxford Corporation Bill contains a part devoted to the purchase of the undertaking of the Oxford Gaslight and Coke Company. It is provided that the Company, with the consent of three-fifths of the votes of the shareholders present personally or by proxy at a special meeting, may sell their undertaking for a price to be agreed upon, whereupon the usual procedure for the dissolution of the Company and the administration of its powers by the Corporation is to follow. The Coventry Corporation Gas Bill is, among other things, to authorize the Corporation to construct a railway between their gas-works and the Coventry and Nuneaton railway of the London and North Western Railway Company. The line is to be 2 furlongs 7·40 chains long, all in the City of Coventry, and is to be completed within three years. The sum of £10,500 is to be borrowed for the purposes of the Act. The Birkenhead Corporation Act is to extend the gas district to include the township of Noctorum in Cheshire. Small debts due to the Corporation for gas, &c., are to be recoverable in a court of summary jurisdiction; and meters, &c., the property of the Corporation are to be exempted from distress. The Bury Corporation (Gas-Works Siding) Bill is to enable the Corporation to make a connecting railway 4 furlongs and 0·86 chains long between their gas-works and the Lancashire and Yorkshire Railway Company, at an estimated cost of £21,300. The sum of £25,000 is to be borrowed for this purpose.

The following are special Electric Lighting Bills: The City of London Electric Lighting Bill is to authorize the House-to-House Electric Light Supply Company, Limited, to erect and maintain electric lines and works, and to supply electrical energy within the City of London. The preamble merely recites that a Company by that name was formed in 1888, and that it is expedient that the Company should have the powers desired; but there is no statement in the preamble of who and what the Company are, or what they have done, or of their means. Later it appears that the Company have a share capital of £350,000; but nothing is said of the amount paid up. The rate of charge for energy is to be 8d. per unit, with a minimum of 13s. 4d. per quarter. Overhead wires are forbidden except with the express consent of the local authority. The Dundee Gas and Electric Light Bill is to authorize the Dundee Gas Commissioners to supply electric light within the burgh of Dundee. It is the Model Act, with modifications. A provision is inserted that the charge for energy is to be calculated at a rate to just meet the expenditure for each year, the sinking fund for repaying the capital borrowed for this purpose being calculated at 4 per cent. The Glasgow Corporation Bill contains a part relating to electric lighting, which is to empower the Corporation to deal with the matter upon terms similar to the preceding. The Saint Martin-in-the-Fields Electric Lighting Bill is to endow Messrs. A. and S. Gatti with statutory powers for supplying electric lighting in a limited portion of the Strand with Adelaide Street as a centre, upon what may be called the standard rates of 8d. per unit and a minimum of 13s. 4d. per quarter. The Strand Electric Lighting Bill is to authorize the same undertakers to supply within the parishes of St. Paul, Covent Garden, and St. Clement Danes. The Sutton, Southcoates, and Drypool Gas Company (Electric Lighting) Bill is to authorize agreements between the Company and the Corporation of the Borough of Kingston-upon-Hull for the supply of electricity for lighting purposes. The preamble recites, among other matters, that the Company supply gas on very moderate terms, and are prepared to do the same for electricity. The Bill provides that the Gas Company may agree with the Corporation to supply electricity or to transfer their undertaking to the Corporation. A sum not exceeding £30,000 is to be set apart for the new undertaking; on which a dividend of 10 per cent. may be paid, if earned out of the business, or of 7½ per cent. only if it comes out of the general revenues of the Company. For the purposes of this Bill, the Company are to borrow £20,000. The Company and the Corporation appear to be each other's "double" in regard to this business.

Death of Mr. W. Fendick.—We regret to record the death, at the early age of 34, of Mr. W. Fendick, Engineer and Manager of the Tonbridge Gas Company. Mr. Fendick had only held his appointment five years; but he had won the respect and esteem of all with whom he was associated.

Allan's "Analysis of the Accounts of Gas Companies and Corporations for 1888-9," a copy of which has been forwarded to us by the publisher (Mr. J. Allan, Crane Court, E.C.), contains a large amount of statistical information in regard to some of the most important English gas undertakings, and the principal one in the Sister Isle. The accounts of eighteen Companies, fifteen Corporations, and two Local Boards are dealt with, and the results systematically stated with explanatory footnotes where necessary.

The Northwich Holder.—Our attention has been called to certain points in our report of the proceedings at Northwich on the 18th inst., and to our comments thereon, as given in the JOURNAL last week, which require a few words of explanation. In the remarks made by Mr. Gadd as to the strengthening of the holder to prevent the possibility of local distortion, he stated that he believed the holder was three times as strong as it need be. It should perhaps be pointed out, to avoid possibility of misunderstanding, that Mr. Gadd was describing a detail strengthening of the holder; and what he meant was that in this particular, not as a whole, the holder was three times its necessary strength. In our general comments on the subject, we stated that the holder had been built without very close regard to cost. We have since learned that, as a matter of fact, five well-known firms were invited to tender for the work, and the lowest was accepted. In order to ascertain what the saving would be, three leading firms were asked to quote for the same size of holder, with the usual upper guide-framing; and the result was that the lowest tender submitted was 33 per cent. higher than that for the holder on the Gadd and Mason system. Beyond this, however, there was a saving in the cost of the tank, which was constructed at considerably less expense than would have been incurred had the old system of piers been adopted.

The Blackfriars Gas-Testing Station.—We understand that Dr. S. Rideal has resigned his appointment as Gas Examiner to the London County Council, owing to the unsatisfactory results he has obtained at the above-mentioned station during the last few weeks. It appears that before the strike commenced at the South Metropolitan Gas-Works, irregularities were reported in the working of the photometer, and that subsequently, when the pressure of the gas was reduced, it was found impossible to pass the gas through the photometer meter at the prescribed rate. After enlarging the slit in the regulator, to admit of a greater flow of gas through the apparatus, continual low results have been obtained at the station; the mean illuminating power for the last three weeks, as reported to us by Mr. Dibdin, being 14·2, 12·8, and 14 candles. It appears that, notwithstanding these abnormal results, no special instructions were issued either by the County Council or by the Gas Referees, and that it has only been within the last few days that the Referees have visited the station. Tests obtained on their visit showed 11·2 candles as the illuminating power of the gas; while a few days later 18·8 candles was recorded as its lighting value. These wide variations can hardly be attributed to the gas, but seem to indicate that changes of temperature in the service-pipes to the building, or some other unknown causes, have been producing such marvellous results. With the Gas Referees' present "Notification" in force, it must take the poorly-paid Gas Examiners a considerable portion of each day to perform their duties under these conditions.

NOTES.

The Difference between Coke and Charcoal.

Dr. W. Thoerner, in an article published in *Stahl und Eisen*, gives the result of a series of experiments designed to bring out the comparative characters of coke and charcoal. He points out that charcoal consists of a large number of more or less regularly arranged cells, joined to one another longitudinally. The walls of the cells are easily permeable by gases, and readily oxidizable. Coke, on the contrary, contains generally separate unconnected cells or groups of cells, the walls of which are composed of a dense vitreous substance which is impermeable by gases and exceedingly difficult to oxidize. Coke acts differently to charcoal in the furnace, and less advantageously because of these differences. If, therefore, it were possible to cause the structure and character of coke to more nearly resemble charcoal, either by rendering it more porous without sacrificing strength, or by making it more easily oxidizable, the coke would be greatly improved. Dr. Thoerner gives the results of several analyses, from which it seems that ordinary gas coke possesses lower real and apparent specific gravity than oven coke, and shows more cell space in its substance. Wood charcoal possesses thrice the purity of coke, with much lower specific gravity and sometimes double the cell space. Pine charcoal, the most porous of all, possesses the densest charcoal substance. In charcoal, the smallest details of the original structure of the wood are preserved; the arrangement of the cells being such that the gaseous products of carbonization can easily escape without rupturing the substance. Consequently, when the charcoal is burnt, the entrance and circulation of oxygen in the cells is equally easy. The charcoal substance does not pass through a stage of fusion in the carbonizing process; whereas in coke the substance has been fused into a dense, impenetrable, vitreous mass through which, in consequence of the want of continuity between the cells, the oxygen can only slowly penetrate.

An Oil-Gas Lamp.

An ingenious modification of the oil-gas method has been adapted by Mr. Gilbert Robinson, of Elland, in the design of a high-power lamp of the Lucigen class, for outdoor purposes. The object of this new variety of the order of lamps that have seriously interfered with the prospects of the electric arc lamp for a variety of purposes, is the abolition of all outside mechanical appliances for generating the light. Pressure is required, of course, and this is obtained by confining the gas produced from a portion of the liquid hydrocarbon combustible exposed to the heat of the flame for this purpose. The lamp is thus made independent of pumping, air-compressing machinery, &c., and only needs to be started by making the burner hot with the flame of a handful of oily waste burnt in a receptacle provided for the purpose. The oil is then turned on, and the lamp works automatically until the reservoir is emptied. This simplicity of principle permits of simplicity of design. The gas-making portion of the lamp comprises a tube in which the oil is exposed to the heat of the flame. When the gas is made, it is divided into two currents—one going into the top of the reservoir, to force the oil out into the carbonizing-tube; the other going to the jet, whence it issues, after a few minutes' working, at a pressure of 20 lbs. It is thus oil gas that is burnt; and the maker calculates that by this means a light of 3000 candles can be obtained at a cost of 2d. to 3d. per hour, according to the facilities for obtaining the common oil required.

Lead Contamination of Water Cured at Dessau.

Lead-poisoning having occurred at Dessau in 92 cases, a Commission was issued to discover the cause, which was immediately traceable to the water supply. It then became necessary to ascertain whether the water was originally poisonous; but it was soon found to have acquired this quality in the course of distribution through the lead service-pipes used in the town. Experiments showed the water to be extremely soft; and when its hardness was increased by the addition of finely-powdered limestone, it ceased to corrode lead. Further inquiry demonstrated that it was not the hardness that rendered the water innocuous, but the deprivation, by agitation with the limestone, of the carbonic acid originally contained in the water, and which attacked the lead. To permanently cure the evil, an apparatus has been set up at the water-works to mix automatically a definite quantity of powdered limestone with a certain proportion of the water passed through the works. The mixture is then, after agitation, returned to the bulk of the supply; and the result is a complete cure of the mischief—not a single case of lead-poisoning having occurred since the apparatus was set in regular operation. The quantity of powdered limestone required for this service at Dessau is about 200 cubic centimetres every two minutes.

The Electrification of Flames.

The fact that a luminous flame of coal gas is electrified was demonstrated by Mr. S. Bidwell, F.R.S., at a recent meeting of the Physical Society. Mr. Bidwell had been describing and exhibiting some experiments with a steam-jet, which he showed to be increased in opacity by bringing electrified points near it. The colour also is changed to orange brown. The author concluded that electrification causes an increase of the size of the water particles in the steam. This electrification is producible by the neighbourhood of luminous gas-flames; wherefrom it is concluded that the flames themselves must be electrified. Mr. Bidwell has tried the effect of gas-flames on water-jets, and finds that when luminous they influence the jets considerably, rendering straggling ones more coherent, whereas non-luminous flames had no appreciable effect. He also found that luminous flames are positively electrified; and he demonstrated the fact before the meeting. Professor Reinold, F.R.S., Chairman of the meeting, said he had recently noticed that gas-flames are electrified. Dr. Fison also said he had made experiments on the electrification of flame, and found that potentials varying from + 2 volts to − 1½ volts are obtainable in the region within and surrounding a Bunsen gas-flame. Steam from dirty water, according to Mr. Bidwell, is not affected by electrification or flame. There is some question, however, whether the effect on water-jets produced by flames may not be due to the presence of dust, which would facilitate condensation.

Mr. John Nash, the Chairman of the Farnham Gas Company, is resigning that office on account of failing health. Mr. Nash has been connected with the Company since 1839; and was appointed Chairmanon July 12, 1867.

The Liquidation of the Nottingham and Derby Water Gas Company.—On Monday last week, Mr. Justice Stirling appointed Mr. J. T. M'Craith, Mr. A. L. Wilson, and Mr. T. A. Welton, Official Liquidators of the Nottingham and Derby Water Gas Company, Limited.

New Capital for Electric Light Undertakings.—According to the *Investors Guardian*, the total amount of the capital proposed to be raised by electric lighting companies registered last year was £5,388,600, as compared with £8,026,500 in the preceding year—a decrease of £2,637,900.

The Proposed Memorial to the Late Dr. Joule.—The suggestion that a memorial should be raised to the late Dr. Joule, which emanated from the Council of the Royal Society towards the close of last year, has taken definite shape. The proposed memorial is to be of an international character, and have for its object the encouragement of research in physical science; but the scheme will include the erection of a tablet or bust to his memory in London—a Manchester Memorial Committee having already taken steps to ensure a suitable monument being erected in Dr. Joule's native city.

Woodhouse and Rawson United, Limited.—The Directors of this Company have decided to pay an interim dividend for the half year ending Dec. 31 last in respect of profits realized since the formation of the Company, at the rate of 8 per cent. per annum on the preference, and of 15 per cent. per annum on the ordinary shares, payable on the instalments from the date of their payment. In notifying this to the shareholders, the Directors refer to the prosperous condition of the Company, and to the success that has attended it since the amalgamation of the various businesses it was established to acquire, the transfer of which is in steady progress. They confidently expect that the results of the present year's working will fully confirm the anticipations put forward on the formation of the Company.

The "Etoile" Lamp.—The immense superiority of gas over electricity for lighting, so far as economy is concerned (and the commercial question is really the most powerful factor in any competition) was amply demonstrated in the presidential address recently delivered by Mr. John West before the Manchester Association of Engineers, of which an abstract appeared in the JOURNAL last week. It will be of interest now to give a few particulars of one of the most recent improvements in regenerative lamps, to which Mr. West particularly referred, amongst the modern appliances for securing the best results from gas as an illuminant. The name of Fourness has long been associated with regenerative gas-lamps, and his son, Mr. W. A. Fourness, who is following in his father's footsteps in introducing further improvements in the same direction, has brought out the "Etoile" lamp, for which it is claimed that it is the most economical appliance of the kind yet produced; giving an unusually brilliant and steady light at a small cost—the combustion being so complete that a pure, healthy light is disseminated, whilst the lamps are so constructed as to be safe against fire. For the manufacture of the lamp, works fitted up with special plant, including a spacious foundry for brass and iron, have been laid out at Manchester; and in devising the lamp, Mr. Fourness has fully considered the most essential elements to efficient lighting. He has studied economy in gas, durability, and rigidity, besides giving due attention to the parts most liable to deterioration by making them of suitable material. The principal parts are constructed of iron of the very best quality, and ornamented to suit different styles of architecture; the extent of which, of course, depending upon the price the purchaser will pay. The lamps are finished in black enamel for works, mills, and other premises; while for offices and private premises they are manufactured in ornamental designs in steel bronze. These lamps are already in use in the principal Manchester theatres, in the St. Bede's Colleges, as well as in a number of large business premises; and the testimonials received fully demonstrate that they possess the special advantages which the inventor has claimed for them.

COMMUNICATED ARTICLE.

WATER GAS FOR BRITISH GAS-WORKS.

By C. J. R. Humphreys, of Lawrence, Mass.

I have been very much interested in the article which appeared in the JOURNAL for Nov. 19 last year (p. 962), entitled, "Is Water Gas Possible for British Gas-Works?" wherein you—very justly, I think—make the point that at this time it is not wise to declare that water gas is inadmissible to British Gas-Works. The article interests me particularly, as I have been using water gas in connection with coal gas at my own works; and on this general question I should like to speak at length. I will, however, reserve what I have to say on the point for another time; and will consider in the present communication that portion of your article in which you deal with inclined retorts in connection with the manufacture of water gas. This is a very interesting phase of the question, because, admittedly, where water gas is to be used as an auxiliary in connection with the manufacture of coal gas, the coke resulting from the manufacture of gas by the regular process is the fuel which should be used in the production of water gas—firstly, because the fuel is right at hand; and, secondly, because it disposes at once of a portion of a residual product which at times is nearly a drug on our hands. Obviously, then, the scheme is to convey the coke from the retorts to the cupolas with the least possible amount of labour; and if the heat which the coke possesses when it leaves the retorts can be retained till it is deposited in the cupolas, there is a very decided gain. I believe that in some gas-works in this country—notably the Kansas City works—the coal is conveyed from the retorts (which are horizontal, fired by generator furnaces) to the cupolas in buggies; but clearly more labour is involved in the scheme than would be required if inclined retorts were used, and so disposed that the coke from them would drop readily into the cupolas—or generators, as perhaps they are more commonly called. In fact, it was when the manufacture of fuel gas came under consideration, and the imperative necessity of reducing the labour per 1000 cubic feet of gas manufactured to the lowest point was apparent, that the advantages of inclined retorts presented themselves. From these investigations there grew the fuel-gas process of Messrs. A. C. Humphreys and Walton Clark, which combines the inclined retorts for the manufacture of coal gas and the generators for the production of water gas.*

In the article to which I have already referred, the statement is made that the combination of the inclined retort and the water-gas generator is made use of in more than one fuel-gas process; but, as far as my knowledge goes, it is only used in the Humphreys-Clark process. As I have had an opportunity of making a cursory examination of the experimental plant which has been put up at Jersey City to show the working of the process, a short description of the scheme may not be without interest; reserving for a future occasion a more extended description of the plant, with an account of the results obtained. Concisely stated, the works consist of two benches of inclined retorts, and a generator in front of each setting adjacent to the lower end of the retorts; and the dampers and valves are so arranged that the "blow" gases from the generators can be passed round the retorts of either or both of the settings, or they can go direct to the stack, or any portion of the waste gases can be lead to the settings, and only the balance allowed to escape through the chimney. In working the plant, the coal (ordinary bituminous gas coal) is conveyed to the upper ends of the retorts on an overhead track in buggies with openings in the bottom through which the coal is dumped on to a shoot, which guides the coal into the mouth of the retort. The arrangement of the shoot is somewhat peculiar, and of such a nature that the angle it makes with the mouth of the retort can be quickly changed. By experiment, it has been determined what is the proper angle to employ for different kinds of coal; consequently it is found easy in practice to discharge the coal from the buggies into the retort so that the coal will be spread evenly over the length of the latter, without any danger of running through the retort into the channels connecting the generators and the retorts. The coal is baked in the retorts in the usual time—viz., four hours—during part of which the water gas from the generators is allowed to flow through the retorts; the hydrogen absorbing most of the lighter hydrocarbons which in ordinary distillation pass off as tar. From the retorts the combined gas passes through a hydraulic main, and is drawn by an exhauster through condensers, scrubbers, &c. At the end of the period of distillation the red-hot coke is pushed from the retorts into the generator. During this process it is not found necessary to remove the lid, as, by a peculiar plunger device, the coke is readily pushed from the retort. By this means the retort is in a few seconds emptied of the coke resulting from the carbonization of 250 lbs. of coal. The retorts are heated by the waste heat of the gases which pass off from the generators during the time of "blowing up;" and the interiors of the retorts are heated by the passage through them of the hot water gas made during the run.

It will thus be seen that the process embodies many economies—the utilization of a portion of the waste or "blow" gases from the generators; the absorption of a portion of the heat of the water gas (which those who have made water gas know to be an item of importance); and the conservation of the heat which the coke possesses as it passes from the retort. Add to this the almost infinitesimal amount of labour involved—the term is not too strong when we remember that all the labour required besides working the valves is the filling of the coal-buggies and conveying them to the elevator—and the licking up of the tarry vapour by the water gas in the retorts (for it is found that very little tar is collected in the drips), and we have the promise of a very cheap gas. The resulting gas is, of course, a mixture of coal and water gas of but very low illuminating power, but exceeding in heating effect many of the so-called fuel gases. Add to this scheme an oil carburetter and superheater, and by the use of 2 gallons of Lima crude oil per 1000 feet, a good illuminating gas could be produced. We thus see the vast possibilities of such a plan—not in the fuel-gas field alone, but also, and perhaps to a far greater extent, in that of illuminating gas, unless the future development of the plan brings to light some unforeseen and untoward obstacle.

I hope to be able, in the near future, to take up this matter again, and describe the plant more in detail, and give more information in regard to the nature of the gas produced.

* The patented arrangement here referred to was illustrated in the JOURNAL for Sept. 10, 1889, p. 504.—ED. J. G. L.

The Amines Process for the Treatment of Sewage.—According to the *Essex County Chronicle*, Mr. J. Ambrose, a member of the Main Drainage Committee of the London County Council, has been trying an experiment on his farm at East Hanningfield, with manure prepared by the Amines process, of which a description was given in the JOURNAL for Sept. 3 last year (p. 447). A quantity of sludge cake was put upon a wheat-field, with the result that it has been declared to look the best in the parish.

The Dangers of Electric Wires.—On Monday last week, a singular and fatal accident from electricity occurred at Newburgh, in the State of New York. It appears that a man tied his horse to a post while he entered a shop. The horse happening to put his nose to the post, fell as if he had been struck by a poleaxe. A stalwart labourer ran to help the horse, and, chancing to touch the post, he fell down dead. A second man, who went to the help of the first, was stunned, though not killed. The explanation given is that an electric light wire became slack under the weight of the rain, and rested upon the frame of an iron awning, whence the current was conducted through the post to the ground. The horse's nose being moist, he became part of the deadly circuit; but was not killed. According to a telegram that was received from Vienna on Thursday night last, the Queen of Greece was in considerable danger the previous Monday. She was driving through one of the streets of Athens, when an electric lighting wire snapped. One section fell upon the Queen, and tightly encircled her. Had she not been promptly extricated, she would have lost her life, as a few minutes later the current was turned on.

Institution of Mechanical Engineers.—The annual general meeting of this Institution will be held on Wednesday, Thursday, and Friday of the present week, at the Institution of Civil Engineers. The President (Mr. C. Cochrane) will take the chair at the opening meeting; but, after the transaction of the formal business, will give place to his successor, Mr. J. Tomlinson. Among the papers to be read during the meeting will be one on "The Mechanical Appliances employed in the Manufacture and Storeage of Oxygen," by Mr. K. S. Murray, of London. The communication will deal with the abstraction of oxygen from the atmosphere by means of barium oxide, and explain the method of manufacturing this oxide as employed in the Brin process. It will contain a description of the oxygen-producing plant, and furnish particulars as to the cost of production and the industrial applications of oxygen. In connection with this paper, the members will be invited to visit Brin's Oxygen Works, at No. 69, Horseferry Road, Westminster, between 10 a.m. and 1 p.m., and between 2.30 and 5.30 p.m. on the three days of the meeting, and on the following (Saturday) morning till 1 p.m., for the purpose of witnessing the process of manufacturing and inspecting the machinery employed.

An Early Experiment in Street Lighting by Gas.—An esteemed correspondent sends us the following extract from "The Follies and Fashions of our Grandfathers," published in 1807, giving an account of an early experiment in street lighting by gas:—"The proprietors of the Golden Lane Brewery have tried the experiment of lighting a street by coal gas lights. The furnace which supplies the gas is in the brewery in Golden Lane, from whence a pipe proceeds that runs along the walls of the houses of Golden Lane, and passes round the corner along the houses of Beech Street. From this main-pipe other pipes proceed at right angles to the lamps, each of which has an aperture in its lower extremity to receive the pipe appropriated to it. After entering the lamp, two or three small holes, made in the end of the pipe, convey the gas, which, being kindled, gives a very brilliant light. The pipes are furnished with cocks at different places, by which the supply of the gas may be regulated as thought fit. Eleven lamps are supplied in this manner—seven in Golden Lane, and four in Beech Street. The lamps are on an average about 20 yards asunder; the last about 700 feet from the furnace. In Golden Lane the single row of lamps completely illuminated both sides of the lane."

TECHNICAL RECORD.

HOW AN AMERICAN GAS MANAGER OVERCAME A DIFFICULTY FROM SHORTNESS OF COAL.

At the recent Meeting of the American Guild of Gas Managers, Mr. W. ANDERSON, of Marlboro' (Mass.), gave the members an account of a dilemma in which he was placed by an unexpected stoppage in his supply of coal, and described the means adopted for extricating himself therefrom. Although English gas managers are not likely to derive the same benefit from the publication of Mr. Anderson's story (which appeared in a recent issue of the *American Gaslight Journal*) as their brethren across the Atlantic, the following particulars may not be without interest.

When Mr. Anderson went into his works, on the morning of the 21st of November last, he found he had only 5000 cubic feet of gas on hand, and nothing with which to make any more but Cumberland coal and a few barrels of gas oil. The fireman had charged the bench with 1000 lbs. of this coal before Mr. Anderson arrived at the works (about 7 a.m.). For three or four days previously, he had been using half Youghiogheny and half Cumberland coal. He was sending out from 25,000 to 30,000 cubic feet per 24 hours, with a storeage capacity of 18,000 feet. He had only one bench of fives fired up, as he had been expecting coal every day; but it failed to arrive. With the half-and-half mixture, he was able to keep the lights burning with the one bench; and was obtaining a yield of 4·74 cubic feet of 17-candle power, using five gallons of oil per ton of coal. As soon as he arrived at the works, he had the other bench of fives, in which were small retorts (12 in. by 20 in. by 8 ft. long), fired up. It was an old bench, which he had used for two seasons, and called a "summer bench." He drove it for all it was worth, in order to get the heat up in it as soon as possible. The first charge of all Cumberland coal went into the retorts at 6.30 a.m. At 10.30 the coals seemed to be as fat, so to speak, as if they had been in but one hour; so he allowed them to remain for another hour. At the end of this period, they were found to be still capable of making gas. At the sixth hour the lids were taken off; and when the coke was exposed to view the retorts were packed as full as they possibly could be—the coal had expanded so greatly. He used 3 gallons of oil with this charge; and he found he had made 4400 cubic feet of gas—an average of 4·50 cubic feet per pound of coal and oil combined. He thus ascertained that he could not charge more than one-half as much Cumberland coal into the retort as he could straight gas coal. He had been putting in 1200 lbs. of Youghiogheny, and 750 lbs. of Cumberland; and even then the retorts contained in bulk more coke (with 750 lbs. of Cumberland) than they did with 1200 lbs. of Youghiogheny. As the Cumberland was quite fine, he saturated each charge of 150 lbs. with half a gallon of oil, and used about 3 gallons with injectors; making 5½ gallons of oil to each 750 lbs. of Cumberland coal.

As the day was cloudy, the proprietors of the shops were using the gas nearly as fast as it could be made. At 4 p.m. there was on hand 3000 cubic feet; at 7 p.m. the holders were resting quietly on the bottoms of the tanks. By the time Mr. Anderson had been able to get a dull red heat on the small bench he had fired up in the morning, he thought he would be able to make oil gas in it. So he saturated 100 lbs. of Cumberland coal with about a gallon of oil, and charged each retort with it. In the other bench he was running three-hour charges with something of the same mixture. The illuminating power was about 20 candles; and it was not until some consumers came to the works to find out what the trouble was—saying they could smell kerosene all over the town—that it was thought advisable to drop the oil. Then Mr. Anderson began to use pure, unadulterated Cumberland coal; sending the gas direct from the retorts to the burners. Now the real trouble began. The illuminating power of the gas fell to a very low point—something like a candle at times—and how he managed to pull through he hardly knew. He used, from the morning of the 21st to the morning of the 22nd, 7300 lbs. of coal and about 40 gallons of oil; and made 23,000 cubic feet of gas—an average of 3·15 cubic feet per pound of coal and oil. On the morning of the 22nd, he had on hand 3000 cubic feet of gas of about 12-candle power. Fortunately, at 9.30 three cars of Youghiogheny coal arrived; so with ten retorts Mr. Anderson was again able to supply the town with proper gas.

Since the dilemma, Mr. Anderson has made some experiments with Cumberland coal under the most favourable circumstances; and of these he gave his colleagues a summary. He charged each retort in his small bench of fives with 100 lbs. of Cumberland coal, and placed a jet photometer at the outlet of the purifiers, before entering the station meter. The yield in the first hour was 620 cubic feet; in the second hour, 1620 cubic feet; in the third hour, 2340 cubic feet; and in the fourth hour, 2470 cubic feet. The highest illuminating power obtained was 16 candles; the lowest, 11 candles. The average yield of gas was 4·94 cubic feet of gas per pound, without the aid of any enricher. The coke obtained from 500 lbs. of Cumberland coal was 16 bushels, or 64 bushels per ton of 2000 lbs. The coke weighed per bushel, after being quenched, 38½ lbs.; dry, 31 lbs. The coke from a ton of Cumberland coal would therefore weigh, when first quenched, 2432 lbs.; dry, 1984 lbs.

THE VALUE OF GASEOUS FUEL.

A Committee of the Chicago City Council recently had under consideration the subject of gas supply. They were assisted in their deliberations by Professor E. COLBERT, who laid before them a few statistics in regard to the use of gas as fuel.

The Professor remarked that the great value of good fuel gas, as compared with coal, for domestic purposes lies in the fact that the ordinary grate does not utilize more than about 5 per cent. of the heat-energy stored in the fuel. The best stoves and furnaces seldom utilize more than 7 or 8 per cent. On the other hand, 75 per cent. of the heat-force contained in gas can be actually used for cooking or warming. Under ordinary conditions, 50 per cent. is a moderate allowance in the use of gas, especially if the opening be so constructed as to permit the escape of no more heated air than is necessary for steady combustion. This, he pointed out, is where the saving comes in. There is no manufacture of force in the process of gas making. It is no more possible to increase the original energy locked up in a given quantity of fuel than it is to invent perpetual motion. In fact, not more than 75, and often not more than 50 per cent. of the force in the coal is to be found in the gas. The rest is lost in the conversion from solid to gaseous fuel. But if the change is effected at the minimum of cost, the fuel cost of gas in the holder will still be less to the ordinary domestic consumer than is its coal equivalent in the yard of the dealer; and the cost of distributing the gas through the pipes and mains of a large city is really less than hauling and carrying in the coal.

Professor Colbert then went on to remark that many people talk about 1000 cubic feet of gas as if its value for fuel or for illuminating purposes were nearly as much of a standard quantity as is the pecuniary value of a gold dollar. This, he said, is an error. You can get anywhere from 8000 to 10,000 cubic feet of gas out of the same ton of good quality of coal with little more heat-energy in the larger quantity than in the smaller one. Probably the most useful in proportion to its bulk would be that of which not less than 30,000 nor more than 50,000 cubic feet were obtained from a ton of good Illinois coal. Taking the inside figures at $1·50 per ton for material, the cost would amount to 5c. per 1000 cubic feet, which need not be increased by a partial substitution of crude petroleum. The cost of labour and other incidentals need not exceed another 5c.; the sum of the two being the cost of the gas in the holder. Chemically considered, it would require about 55,000 cubic feet of this gas to equal the ton of coal. Applying the foregoing percentages for waste in two cases, it will be seen that some 90,000 cubic feet would be used and wasted in obtaining the ton's worth of energy; and a ninth part of this, or 10,000 cubic feet, would yield more heat than is obtained from the same ton of coal in the ordinary grate or house stove. Doubling this, for safety and to cover cases in which the saving may be claimed to be greater, we have an allowance of 20,000 cubic feet, or about 800 lbs. in weight of gas, as fully equal in value to the 2000 lbs. of coal. Turning to the cost of distribution, Professor Colbert pointed out that it varies widely with the quantity supplied to consumers in proportion to the area occupied by them. He thought that for about $3 the inhabitants of Chicago could have 20,000 cubic feet of natural gas having a usable fuel-value of not less than a ton, and in many cases rising nearer to two tons of coal, according as the latter has been used more or less wastefully in the household. He pointed out that with this would be avoided the trouble and annoyance of carrying in coal, taking out ashes, and the risk of indictment for committing a smoke nuisance, to say nothing of the benefit to be derived from breathing a purer atmosphere.

The Public Lighting of the City of London cost last year, according to the accounts of the Commissioners of Sewers which have just been issued, £12,585.

High City Water Pressure.—An answer to an inquiry on high city water pressure, says the *Engineering and Building Record*, published in a recent number, is found in a letter to the San Franciscan *Mining and Scientific Press*, from Tombstone, Ariz, which says: "Situated in a dry country, where springs are miles apart, the city is furnished with as pure, excellent water as any town in the United States. The city water-works and the Sycamore Spring Water Company both furnish good and sufficient water for domestic purposes. The latter Company has a a pipe-line eight miles long, which conducts the water from the Sycamore Springs, near the base of the Dragoon Mountains. The Huachuca Water Company, an Eastern corporation, has expended $500,000 in bringing water to Tombstone from the loftiest range of mountains in this vicinity, the Huachucas—a distance of 31 miles. At the mountains is a reservoir holding 1 million gallons. The pipe leading to the city has a capacity of 45,000 gallons per hour. At the lowest point, where this pipe crosses the valley of the San Pedro, it is subjected to a pressure of 1900 feet. The Tombstone reservoir, with a capacity of 1,200,000 gallons, is 360 feet above the city, and 1100 feet below the level of the mountain reservoir. The pipes lead to all parts of the town. For fire purposes it has a pressure of 160 lbs. to the square inch."

ELECTRIC LIGHTING IN LONDON.

At the Meeting of the Civil and Mechanical Engineers' Society, at the Westminster Palace Hotel, last Wednesday—the PRESIDENT (Mr. H. Adams, M. Inst. C.E.) in the chair—a paper on the "Present Aspect of Electric Lighting in London" was read by Mr. E. C. DE SEGUNDO.

The author considered that the fact of so many well-known commercial and professional men having connected themselves with electric lighting companies, was a proof that this system of illumination had passed the experimental stage, and was fairly on the way to assured success. He referred briefly to the various schemes on foot for the supply of electrical energy; but only considered two in any detail—that adopted by the London Electric Supply Corporation, and that of the Metropolitan Electric Supply Company. He pointed out that the former had laid themselves open to the charge of putting "all their eggs in one basket;" and he suggested that the use of engines of so high a horse-power as they proposed might tell a great deal against the alleged economy of the whole system, inasmuch as it was very uneconomical to run an engine lightly. There was also the further disadvantage that should a bearing of the 10,000-horse engine or dynamo heat badly, about 200,000 lights, or their equivalent, would be extinguished by the stoppage of the engine. The advantages of such a station as that at Deptford were dwelt upon—namely, the possibility of using cheaper coal, not having to pay for water or rent, and being able to condense. It appeared to be further claimed that considerable economy would be effected, as compared with the multiple generating unit-system, in the expense of the necessary staff; but this the author did not seem to consider of much importance when taken in conjunction with other questions, such as the loss in the six miles of mains from Deptford to London, as well as that due to the extra transformation.

Reference was next made to the system of the Metropolitan Electric Supply Company, who produce electrical energy at a number of generating stations distributed over the area of supply, all the stations being connected by trunk mains. The author said this Company claimed that, by having their works on the spot, any diminution in the supply due to sudden changes of the weather from clear to foggy could more easily be provided against than if the generating station were at a distance. Also that immunity from failure of supply was effectually secured, seeing that the breakdown of a single engine or dynamo would not be noticed by the consumer; and even if a complete station were to fail, the spare power of two or more of the remaining stations could be requisitioned to supply the deficiency thus created. There was, further, the advantage of only one transformation, and lower pressure in the main, as against two transformations and a very high pressure with the other system.

Having alluded briefly to the vexed question of underground as against overhead wires, the author concluded by stating that it was justifiable to assume that at present there is a "boom" in alternate current machinery, and he would not be surprised to see supply companies revert to the high-tension continuous current transformer system, inasmuch as it was probable that no great difficulty would be experienced in making the efficiency of this system compare very favourably with the mean efficiency of the alternate-current transformer system.

INJURY TO ASPHALTE PAVEMENTS BY ESCAPING GAS.

In the JOURNAL for Oct. 22 last year (p. 786), reference was made to the injury done to the asphalte pavements in certain streets in Frankfort-on-the-Main by gas escaping from the pipes. Our information was obtained from the *Engineering and Building Record*, who were indebted for theirs to the *Centralblatt der Bauerwaltung*. A recent issue of the last-named publication contained the following further particulars bearing on the subject.

In removing the asphalte covering at one of the more seriously damaged places, it was found that the underlying bed of concrete had cracked in the direction of one of the gas-mains. Breaking through the layer of concrete, it was further discovered that the crack extended almost vertically clear through the bed, and contained a sticky substance resembling tar. If further evidence had been wanted that the damage was due to gas, it would have been furnished by the exceedingly offensive smell of gas which was encountered. Continuing the excavation, and laying bare the mains, a break in the pipe was found. After having made the necessary repairs, and before again putting down the concrete and pavement proper, iron ventilating-pipes were provided for, which extended to the surface of the street, and afforded a convenient means of escape for accumulations of gas. The results attending this change proved eminently satisfactory; the new asphalte covering having thus far remained in excellent condition. The crack in the layer of concrete is explained by the fact that the asphalte pavement and the concrete bed originally terminated at the place where the crack was found; and in subsequently extending, the union of the old and new layers of concrete was imperfect.

It is probable that the whole matter would thus have been considered as satisfactorily disposed of, had not the possibility of damage to asphalte paving from illuminating gas been seriously questioned by several authorities. To set the matter at rest, two specimens of the asphalte covering used—one damaged as found, and the other in good condition—were sent to the Chemical Pharmaceutical Institute, at Marburg, for examination. In the report that was submitted, it was pointed out that past experience did not sustain the view that illuminating gas was responsible for the trouble. As a matter of fact, asphalte-coated pipes were used at Paris for gas-mains. An experimental investigation was therefore instituted. Pieces of the undamaged asphalte, the size of nuts, were placed in a large glass tube; and the latter was connected with a gas-pipe allowing a current of gas to pass through it. After having been thus subjected to the action of the gas for eight days, the asphalte specimens were taken out, and found to have become soft—readily crumbling to pieces under the pressure of the hand. Similar specimens exposed to the gas regained their original condition after several weeks' exposure to the air. Under the circumstances, there seemed to be little question that the damage to the Frankfort pavement was due to gas. The explanation offered is that a portion of the carburetted hydrogen of the illuminating gas is absorbed by parts of the asphalte destroying cohesion. This view is sustained by the observation that the asphalte regains its original condition after exposure for a time to the atmosphere.

It is interesting to note in conclusion, says our American contemporary, that similar destructive action of illuminating gas on asphalte pavement was observed several years ago at Leipsic. The Chief Engineer of the Department of Canals and Streets at Copenhagen, moreover, recalls the fact that, while pursuing a course of studies in Paris 15 years ago, attention was drawn by one lecturer to the importance of protecting asphalte street pavements from attacks of illuminating gas.

THE DISTRIBUTION OF HYDRAULIC POWER IN LONDON.

In recent issues of the JOURNAL we have given some particulars respecting the arrangements which have been carried out for the supply of compressed air for motive power purposes in Birmingham and Paris. In connection therewith, our readers may be interested in the following account of what has been done in the way of supplying another element for similar purposes in the Metropolis by the London Hydraulic Power Company, under the supervision of their Engineers, Mr. E. B. Ellington and Mr. Corbet Woodall; our particulars being taken from a communication to *The Times*.

It is now more than half a century since Lord Armstrong first directed his attention to the utilization of water pressure and its transmission for mechanical purposes. For the past 30 or 40 years, hydraulic machinery has been in use at docks, at railway goods stations, in warehouses, and elsewhere. But Lord Armstrong's enthusiasm led him to anticipate the time when the practice would be widely extended—when hydraulic power would be drawn from a common centre, especially for fluctuating and intermittent purposes. This dream, has been realized. By the system which was established at Hull in 1876, under the direction of Mr. Ellington, by the system which has been organized in London by the same gentleman, and by a similar undertaking at Liverpool, a service of high-pressure hydraulic power is at the command of large and small consumers, the cost of the power being in direct proportion to the work done.

There are at present under the streets of the Metropolis 40 miles of the Company's pipes, filled with water at a pressure of 750 lbs. per square inch. They are of cast iron, varying in internal diameter from 7 down to 2 inches; and they are kept charged by powerful engines located at Blackfriars and Westminster. The engines at the Blackfriars station are capable of pumping 3 million gallons per week; those at Westminster, 2 million gallons. The rapidly-increasing demand for power has necessitated the construction of a pumping-station at Wapping, which will deliver 4 million gallons per week. The present supply to consumers amounts to about 3,750,000 gallons weekly. This is consumed by rather more than 1000 machines; the power being supplied direct to lifts, presses, and other purposes of similar character without the use of any engine or power-producing appliances, and it can also be used for driving engines of special construction in the same way as steam or gas. The quantity of power used is measured in gallons by meters, and is charged for on a sliding scale, commencing with a minimum of £1 10s. per quarter for 3000 gallons or less, down to about 2s. per 1000 gallons in the case of large consumers. The power is available day and night, and on Sundays, all the year round. The Company consider that, taking all the circumstances into account, it can hardly be a profitable operation to supply public power, under conditions similar to those which exist in London, at less than 2d. per indicated horse power per hour. This would be from £20 to £25 per horse power per annum, working from 50 to 60 hours per week. Where the power used is small, this would compare favourably with the cost of steam. The comparison may not, perhaps, be so favourable with a gas-engine working under the most advantageous conditions.

With regard to the liability of the system to cause accidents, we find that failures of the mains occur occasionally; and, considering the very high pressure with which they are charged,

this is a serious matter. The velocity of water at 750 lbs. pressure through a free orifice being 320 feet per second, a hole only ¼ inch in diameter will pass between 30,000 and 40,000 gallons in 24 hours. The method employed for detecting leakage is based upon an automatic record of the quantity of water forced into the mains. When there is an abnormal increase during any night, particularly during the early hours of the morning, the mains are tested. Pressure-gauges of considerable range are connected to each of the mains radiating from a station. Each main is shut off in succession, and the behaviour of the hands of the gauge will indicate whether there is leakage or not. By closing in succession the valves along a main in which a leak has been discovered, and by using a sounding-rod, nearly the exact spot of the leakage may be determined. On one occasion, from the record of the pumping, a leak was supposed to exist in one of the mains running from the Blackfriars station. An observation was made, and the action of the gauge could only be accounted for by a stop-valve about two miles away, supposed to be closed, passing a small quantity of water, and by a machine near the valve having been left working by an attendant. Upon examination at the spot, the valve was found leaking, as had been expected, and the machine could be distinctly heard at work. It was a small hydraulic pump, and each stroke was indicated by the gauge.

One important use of this high-pressure water circulation has not been mentioned—namely, its utilization in case of fire. A small jet of high-pressure water injected into a larger jet from the ordinary water-works mains so intensifies the pressure of the latter in the delivery hose that a jet of great power can be obtained at the top of a high building without the aid of a fire-engine. Captain Shaw has expressed a very decided opinion as to the value of this high-pressure supply of water for the extinction of fire; but, though the provision of the necessary injector hydrant is comparatively inexpensive, the authrities have not taken up the matter. It has been stated that in Manchester, after the introduction of high-pressure hydrants, the loss from fire was reduced by six-sevenths. In Liverpool the loss was reduced to one-fourth of what it was previously. If the annual loss from fire in London amounts, as is calculated, to upwards of £2,000,000, and if the saving caused by an efficent system of hydrants were only one-fourth or even one-tenth of the economy effected in the cities mentioned, it would be a very large amount annually.

Dissolution of Partnership.—The partnership hitherto subsisting between Messrs. G. Dyson, F. Dyson, E. A. Brotherton, and H. Dyson, carrying on business at Wakefield and Leeds as manufacturing chemists, was dissolved as from June 30 last year, since which date the business has been continued by Mr. E. A. Brotherton on his own account.

San Francisco Water Supply.—Mr. Von Schmidt has prepared a scheme for improving the water supply of San Francisco. The project guarantees a delivery of 30 million gallons of water daily from Lake Tahoe, 250 miles distant from the town. The pipes required in connection with the scheme are to be of steel; and their cost will therefore form a very large item in the total outlay on the works.

The New City Engineer for Liverpool.—The recommendation of the Health Committee of the Liverpool Corporation, that Mr. Henry Percy Boulnois, Borough Engineer of Portsmouth, be appointed City Engineer, Gas Inspector, and Surveyor of Buildings, has been confirmed by the Council. The salary of the new Engineer is to be £850 per annum, with an annual increase of £50 until it reaches £1000 a year.

Prevention of Explosions in Subways.—The recent explosion in a subway in New York, alluded to in the JOURNAL of the 7th inst. (p. 31), necessarily directs attention to the prevention of these accidents as far as possible. In Chicago, where explosions have been very frequent, Professor Barrett, the City Electrician, has devised a system which has been adopted in the municipal building, and found to work well. It consists of a chamber at the end of a tunnel entering the building, through the sides or walls of which the cables are carried for distribution. This chamber is provided with an air inlet and a vent connected with a flue, and so arranged that all gases coming through the tunnel will be carried off by the flue without being disseminated through the building. It will be understood that the tunnel is laid from the main conduit of the system, and is designed to carry the necessary conductors to the building. This conduit opens into the chamber or apartment. A door is provided, so that entrance may be had to the chamber. The cables are carried through the walls or sides of the chamber in any convenient manner; all spaces about the cables as they pass through the walls being practically air-tight, so that there may be no escape of gas into the building. An opening is provided between the chamber and outside; and a flue leading to the top of the building carries away the gas. This flue is preferably one of a stack of chimneys, so that it may be heated, thus causing a strong draught of air through the chamber. Any gas which may enter the chamber will thus be carried off through the flue. This invention has been applied to the Chicago underground conduits, and not only prevents the explosions in the building for which it was specially designed, but it is also stated to be beneficial throughout the system.

REGISTER OF PATENTS.

Combined Gas-Engine and Generator.—Gardie, C. F. L., of Paris. No. 2649; Feb. 14, 1889. [11d.]

This apparatus belongs to that class of motors in which motive power is produced by the expansion of a gaseous mixture arising from the combustion (without explosion) of inflammable gas and combustive air. In patent No. 6161 of 1886, a motor is described based on this principle; but since then numerous modifications and improvements in the construction and operation of the motor have been devised. These form the subject of the present application; the system comprising in principle the following combination:—The gas issuing from a special producer or generator passes into a compressor; and at the same time the air also passes through a compressor of special construction. In consequence of this compression, the gas and air become heated to about 200° C.; and the gas and air, thus compressed, are further heated to about 400° C., by flowing separately into heat recuperators. The gas and air then pass through dividers (which separate them into thin alternate layers) into the motor cylinders, in which the gaseous mixture burns on coming in contact with an igniter. Owing to the combustion, the temperature reaches 1500° C., whereupon the gases expand and drive the pistons in the cylinders. In consequence of the expansion, the temperature falls, and the still heated residues which escape from the cylinders are utilized in the recuperators to heat the gas and air which feed the motor cylinders.

Charging Gas-Retort Furnaces with Hot Residual Coke.—Hislop, G. R., of Paisley. No. 3391; Feb. 26, 1889. [6d.]

The object of this invention is to provide means for directly charging gas producers, and gas or shale-oil retort furnaces with hot residual coke from the retorts heated by such furnaces, in lieu of transferring the hot coke into bogies and charging the furnaces therefrom.

To that end there is formed a mouthpiece upon a crown plate which is bolted on the top of the projecting brick breastwork of the retort oven and over the ordinary cleaning and charging doors; and therefrom there is formed a shoot extending downwards and rearwards through the upper front wall of the furnace at such an inclination as to discharge the fuel at or near the middle of the furnace. This mouthpiece is furnished with a self-sealing door, operated by levers; and it has hinged or jointed to it a hopper which may be raised and held by a catch close up against the front of the retorts, or lowered and retained (by the same or a separate catch) in such a position that it forms an inclined plane over which and through the mouthpiece the hot residual coke drawn from the retorts is discharged directly into the producer or furnace.

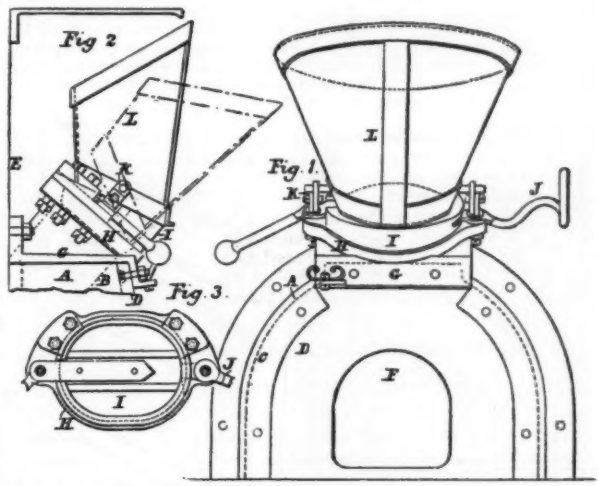

Fig. 1 is a front elevation, and fig. 2 a side elevation, showing the hopper and part of the front of the retort oven. Fig. 3 is a detailed view of the door covering the shoot leading from the hopper.

The crown of the producer is terminated preferably in an arch of brickwork A; and through the top a port or shoot B is formed for the passage of the coke into the producer. The upper or arched portion is bound together by metal jacket-plates C, securely bolted to the front plate D of the producer and the front of the oven E respectively. The front plate is furnished with an upper door F, to facilitate the cleaning of, and a lower one (not shown) for withdrawing the ashes from, the producer. On the top of the jacket-plates and over the opening B for the passage of the coke, a cast-iron crown plate G, with doorway H, is fixed at a suitable inclination from the face of the oven. The doorway H is furnished with ears and stop snugs, and is planed on its face and fitted with a corresponding door or disc I hinged on a pin passing through the one ear and held by a jamming lever J on the other. The disc I at the back passes under pocket-plates fixed on snugs to define the travel and fix the position of the disc. On top of the pins passing through the ears and hinging the disc and jamming lever, adjustable journals K are formed to receive and carry the axis pin of the charging-hopper L. The latter is preferably ovular in form, and expanded at the mouth to the width of the retort or retorts above. The hopper is preferably placed immediately under the central retorts of the oven; and by casting the hinged oscillating disc I sufficiently thick on its lower edge to reduce the angle of inclination, it, when shut, holds the outer edge of the hopper within the line of the retort mouthpieces, and simultaneously with allowing the disc I to fall out of position, by reversing the jamming lever J, the hopper L also falls to the necessary

angle to receive the contents of the retorts above it, which are shot into the producer at such an angle as to deposit them in the centre of the furnace.

Indicating the Presence of Explosive Gases. — Stern, E., and Kaufmann, M., of Cologne. No. 13,668; Aug. 30, 1889. [6d.]

This invention relates to apparatus which will indicate by an electrie bell signal when a certain excess of explosive gas (particularly hydrocarbons) are present in closed localities—especially in coal-carrying ships. The appliance consists of a diaphragm made of thin sheet metal and in bellows-shape, closed at the top but open at the bottom, combined with a porous clay cell or vessel closing the bottom; the diaphragm being connected with one pole of an electric signal apparatus, and contact devices with the other pole. The expansion of the diaphragm is so arranged as to close the line; a metal pin in the perforated bottom of the cell serving to adjust the diaphragm.

Self-Charging and Discharging Gas-Retorts.—Coze, A., of Rheims. No. 16,186; Oct. 18, 1885. [1s. 1d.]

This invention (referred to in the "Notes" column last week) relates to improvements on patent No. 7563 of 1885; the present invention comprising an improved form of retort, and method of connecting the charging mouths or shoots to the retorts, together with an improved construction of truck for charging the retorts.

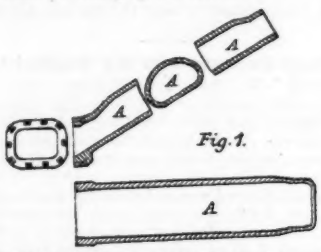

Fig. 1.

Fig. 1 represents details of the retort itself. Fig. 2 is a vertical and transverse section of a bench of retorts. Fig. 3 shows respectively a side elevation, plan, and end elevation of the truck designed for use in charging the retorts.

The retort A (fig. 1), which is made of such form in cross-section as will ensure a regular distribution of the coal, is contracted in depth and breadth at its mouth C, where it passes through the brickwork setting and fits in the bend B of the charging mouth, of which it forms a prolongation. The retort is also slightly contracted at the discharging end. That part of the retort comprised between the front and back walls of the oven is thus of larger cross-sectional area than its two ends, by which means the disengagement of the gases is greatly facilitated, while the coal by gravitating downwards towards the mouth of the shoot is distributed in a regular manner throughout the length of the retort, and choking of the retort at the upper end is prevented.

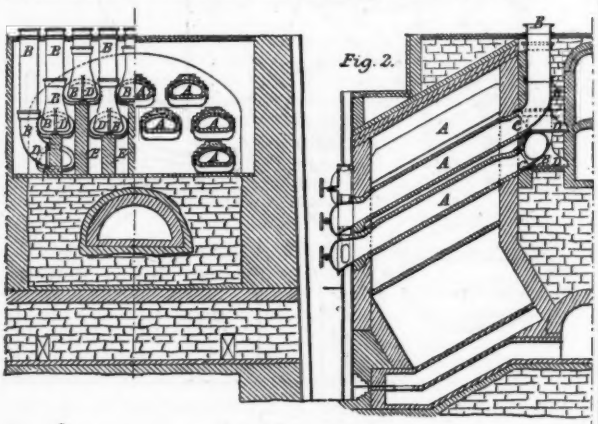
Fig. 2.

Fig. 2 shows the method of constructing the charging mouths or shoots. They are fitted over the mouths of the retorts, which can thus terminate in a plane perpendicular to their axis. The advantage of such an arrangement, both in respect to the manufacture of the retort as well as to the preservation of the joint, will be evident (says the patentee) if it be considered that, in the arrangement described in the previous patent, the cast-iron bend was bolted to the flange of the retort, which being inclined necessarily presented an oblique angle. According to the improved arrangement, each bend is formed with a rib or flange D, forming a sole-piece which is supported upon piers E in the setting or otherwise, so that all strain upon the joint is prevented, and the joints are more easily made and kept in good condition. The charging mouth, as also the retorts themselves, are isolated from the setting, in order to avoid the effects of expansion and contraction.

Fig. 3 shows the construction of the trucks, each of which is provided with several tilting hoppers for charging the retorts. In the example shown, the retorts are disposed in rows of three, in which case the trucks would each have three oscillating hoppers F corresponding to the three charging mouths or shoots B in the same line; but the number of hoppers would, of course, correspond to the number of shoots. The full lines indicate the position of one of the charging hoppers when tilted over the mouth of a shoot; while the dotted lines show the hopper in the horizontal position (as when the trucks are in transit), and also as tilted in the backward direction, for enabling the cover to be replaced

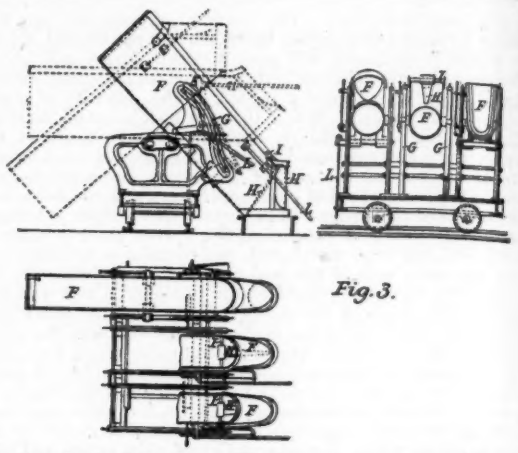
Fig. 3.

upon the mouth of the shoot. The hoppers are supported by roller trunnions in slots; and they are guided by pins engaged in guide slots G of such curvation in relation to the axis of rotation as to ensure the discharge of the coal into the mouth of the shoot whatever may be the angle of discharge. The mouth of the hopper is closed by an automatic gate H pivoted at I, and closing freely against the mouth of the hopper. This gate serves to break the too-rapid descent of large lumps of coal, and prevent their choking the passage into the retort. K is a catch for holding the hopper in the horizontal position; and L, a hand lever for tilting it. It will be seen, the inventor remarks, that the hopper, the shoot, and the inclined retort, together constitute, at the time of charging, a continuous passage down which the coal passes by its own gravity, and is evenly and regularly distributed upon the inclined floor of the retort without risk of obstruction at any point and under the same conditions for all kinds of coal.

Prepayment Wet Gas-Meters.—Valon, W. A. M'I., of Ramsgate. No. 18,641; Nov. 21, 1889. [6d.]

This invention has reference to patent No. 10,598 of 1889,* and has the same object in view—namely, to so construct wet gas-meters that immediately after a certain desired quantity of gas has passed through them, the index (and consequently the meter) will stop, and the supply of gas to the fittings beyond will be cut off.

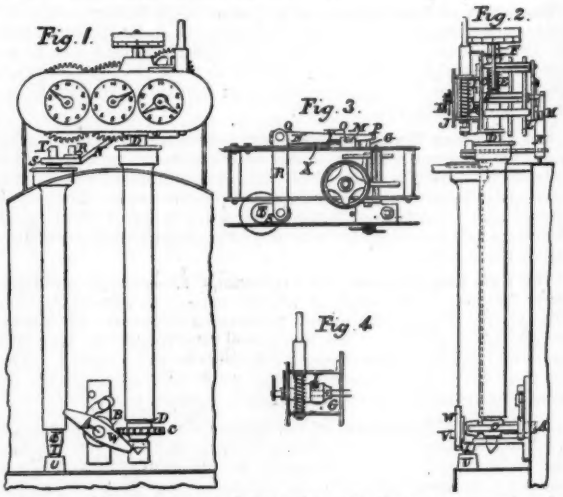

Fig. 1 is a front elevation of the index with the case removed, and a part of the meter with the front plate taken away. Fig. 2 is a side elevation of same. Fig. 3 is a plan of the index with a part of the train of wheels omitted, in order to allow the levers and other parts being exhibited more distinctly. Fig. 4 shows an alternative arrangement in connection with the shaft.

A is the drum-shaft with its worm B, which gears into the worm-wheel C, and drives the upright spindle D, with its worm E near the upper end. The worm gives motion to a wheel F; and this, through another wheel and pinion, drives the shaft or spindle G, carrying with the registering pointer H a projecting pin I. A sleeve or short hollow spindle carries at its outer end the adjustable pointer J, and at its inner end a wheel, to which a disc K is fixed; and this hollow spindle slides over or encircles the spindle G. The disc has a notch (shown in deep black), into which the pin I may enter when the shaft has revolved sufficiently to bring it opposite the notch. Up to this point the invention is similar to that described in the earlier patent; but, instead of there being a stop put upon the upright spindle D, the following contrivance is applied, in order to stop the drum more directly. At the back of the index-plate L is fixed a forked boss or stud M; and to it is pivotted a lever N—the pivot being marked O. At the end P of the lever N, the end of the shaft G presses; and the opposite end Q of the lever is pivotted to an arm R. This arm is again pivotted to a crank S fixed to an upright spindle T, which descends, within a sealed tube, into the front part of the meter, and rests in a step U. At the lower part of the spindle there is a projecting pin V fixed to it; and on the

* See JOURNAL, Vol. LIV., p. 505.

drum-shaft in front of the worm, there is fastened a metal cam W. At the back, between the index-plate L and the lever N, there is attached a spring X; its other extremity bearing against the lever at the point Y. The adjustable pointer is moved into any desired position, much in the same way as described in the previous specification, by applying a key to the upper squared end of a shaft carrying a worm that engages with the teeth of the wheel fixed to the sleeve or short hollow spindle, and to which the disc K is also fastened.

The action is as follows:—Assuming that the pin I is in the notch, the key is applied to the shaft and turned until the adjustable pointer is in the desired position. In doing this the pin is drawn out of the notch and the end of the shaft G will be thrust backwards against the lever N. The effect of this will be, through the medium of the arm R and crank S, to place the pin V in the position shown in fig. 1, so that the drum is free to revolve. When the meter has passed so much gas as will bring the registering pointer H into a position coincident with the adjustable pointer J, the pin I will be pressed by the spring X, through the intervention of the lever N, acting upon the shaft G, into the notch in the disc K; and at the same time the opposite end of the lever will operate upon the arm R and crank S, so as to bring the pin V at right angles to the situation it previously occupied, and intercept the rotation of the cam W, and consequently the drum, so that the meter will stop. When the index is to be re-adjusted, the operation of applying the key as already described is to be repeated.

In fig. 4 a modification of the previous arrangement is shown, in which the pin I is fixed to the disc., and a clutch, having in it a notch, is attached to the shaft G. In action the result upon the shaft G is the same in both cases.

APPLICATIONS FOR LETTERS PATENT.

343.—COTTON, W. T., and CROWTHER, E. F. B., "Improvements in making gas from coal by vertical fire-clay or metal retorts, which are tapered internally, and fitted with slide-valves which are encased in iron or steel boxes underneath the retorts, to empty them when required, and circular pans at the outlet containing water, to make the valve-boxes and retorts air-tight." Jan. 8.

370.—GRENIER, A., "An improved system of articulated joint for the suspension of gas lighting apparatus." Jan. 9.

487.—STOTT, J., "Swing gas-bracket with mercurial seal." Jan. 10.

588.—MACRAE, A. T., and CLELAND, A. M'I., "Improvements in or appertaining to adjustable, suspension, or supporting devices for gas or other lights." Jan. 13.

598.—WYNNE, J. T., and MORRISON, A. C., "Improvements in dry gas-meters." Jan. 13.

634.—CROSSLEY, F. W., "Improvements in gas or oil motor engines." Jan. 14.

694-5-6.—CLEGG, J., "Improvements in the manufacture of light emitters or illuminants for electric and other lamps." Jan. 14.

698.—LAKE, H. H., "Improvements in gas-burners." A communication from W. F. Folmer and W. E. Schwing. Jan. 14.

733.—HALL, W., "Improvements in or relating to gas checks or taps." Jan. 15.

761.—DAHL, O., "Process of generating electricity by gas batteries." Jan. 15.

788.—HORN, W. W., "An improved apparatus for washing gas." A communication from W. Jarrell. Jan. 15.

794.—MAXIM, H. S., and SEDGWICK, G. S., "Improvements relating to the carburetting or enrichment of coal and other gas, and to apparatus therefor." Jan. 15.

860.—CLOUDSLEY, J. L., "Improvements in gas-meter indices for indicating the quantity and corresponding value of gas consumed." Jan. 16.

863.—JOHNSON, T. W., "Improvements in connection with self-generating gas or vapour burners." Jan. 16.

910.—FREUND, E., "Improvements in the process of and apparatus for distilling, roasting, or carbonizing coal for the manufacture of gas; applicable also to the like treatment of other materials." Jan. 17.

The Purnell Gas-Engine Company.—A Company under the title of the Purnell High-Speed Gas-Engine and Manufacturing Company, Limited, has been registered with a capital of £50,000, in £1 shares, to carry into effect an agreement entered into between Mr. J. J. Purnell and Mr. J. White to acquire certain patents, &c., in reference to the above-named engine, and the business, machinery, contracts, &c., connected therewith.

The Liverpool Corporation Water Reservoir at Oswestry.—Another stage in the completion of the new water-works of the Liverpool Corporation has been reached. The reservoir at Oswestry has attained the overflow level; and it contains, it is estimated, 46,112,000 gallons of water. The reservoir is situated about a mile and a half from Oswestry; the water from Lake Vyrnwy entering it through a tunnel nearly a mile in length. It is bounded on its south and south-east sides by a very substantial embankment, about 500 yards long. Between this reservoir and the town of Oswestry are a series of filter-beds, a clear-water tank, receiving chamber, buildings, and other works, the contract for which, amounting to about £70,000, has been carried out by Messrs. Davies Bros., of Wrexham.

Newcastle and Gateshead Water Company's Supply.—At last Tuesday's meeting of the Hexham Union Rural Sanitary Authority, a letter was read from Mr. G. Smith, Secretary to the Newcastle and Gateshead Water Company, in reference to the water supply to Wylam; and in it he mentioned that (with the exception of a few days in the beginning of October) since 1887, the year of drought, the Company had not pumped any water from the River Tyne. Now that the West Hallington Reservoir was finished, and in view of the new works on the River Rede, they hoped that the engines at Wylam would not be furthur required. Apart from this, however, he informed the Authority that the Company were taking powers to erect new filter beds at Whittle Dene, instead of Throckley; and when completed the filtered water would be brought thence a little to the north of Wylam. A connection, therefore, could easily be made to give the inhabitants a supply of filtered water.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Mr. Humphrys on the Specific Gravity of Gases and the Dinsmore Process.

SIR,—Mr. Geo. Keyle, in his letter in the last number of the JOURNAL, contrives to get several inaccuracies and unwarrantable conclusions into a small space. This can only be accounted for by the supposition that, after a very cursory glance over the articles in question, he has recklessly rushed into print with no clear idea as to what he wants to say. He takes up the anomalous position of supporting an argument which he claims to be in need of no support, by means of a prop which he asserts to be valueless. If he wished to accentuate Mr. Valon's arithmetic, or to refute it, why not use his own experiments on the subject. I have touched, incidentally, on one point in Mr. Valon's arithmetic; but it is simply absurd to assert that anything advanced in regard to that one point proves the whole of the figures to be unanswerable. My article on specific gravity contains no assumption as to the condition of gases, no examples, and no suggestions, but consists of obvious deductions from data generally accepted as correct. Whether right or wrong, it cannot be disposed of in the Pecksniffian style adopted by your correspondent. I have nowhere suggested that the very careful experiments recorded by Mr. Lewis Thompson are incorrect.

Salisbury, Jan. 24, 1890. NORTON H. HUMPHRYS.

The Strike of Gas Stokers at Mossley.

SIR,—In reference to the strike of stokers at the Mossley Corporation Gas-Works, an account of which appeared in the JOURNAL for the 14th inst., I am sorry to see that when once the hand is put to the plough there is no turning to look back, as I find in this instance. I am averse to a strike at any time; but is not there enough to cause one in this case? Will the Manager of the above-mentioned works be kind enough to explain the cause of the short make of gas, as stated, as I am at a loss to know how it is that a ton of coals, yielding 9500 cubic feet at one time, should not do so at another? What was the cause of so much decrease? As for the number of men, or the hours they work, this in my experience has nothing to do with it. If there is a regular system of charging retorts, it makes no difference whether the men work eight hours or twelve. As long as there are enough men to continue the charging, whether four hours or six hours charging are adopted makes no difference to my mind; and the strike might have been avoided.

Jan. 24, 1890. A COUNTRY MANAGER.

LEGAL INTELLIGENCE.

LAMBETH POLICE COURT.—Wednesday, Jan. 22.

(*Before Mr.* SLADE.)

Assaults Arising out of the Recent Gas Stokers' Strike in South London.

To-day *James Stack*, 24, a labourer, was charged with violently assaulting Edward Jones, a coal porter in the service of the South Metropolitan Gas Company at the Vauxhall station; and, further, with assaulting two police-constables.

Mr. PASSMORE, who prosecuted for the Company, stated that Jones had been some years in their service, and declined to go out with the other men on strike. On this ground the prisoner and others frequently molested him; and on the previous Monday night, the prisoner set upon him in a violent and cowardly manner. When taken into custody, he struck and kicked the constables. He was known as a most violent character, and had many times been convicted for assaults. He (Mr. Passmore) asked his Worship to punish the prisoner in such a manner as would act as a caution to others against interfering with the men who had chosen to remain at work. The Company had determined to prosecute in every case.

Edward Jones, coal porter, said he had been in the service of the Company for 20 years. On the night in question he went into the Two Brewers beer-house, in Vauxhall. The prisoner and other men out on strike were there, and abused him—calling him a "blackleg" and other names. He took no notice, when the prisoner suddenly rushed upon him, and struck him right and left, cutting his lip and otherwise injuring him. He knew the prisoner as having worked for the Company.

A constable deposed that he arrested the prisoner on a warrant, when he said he wanted to have his tea before he went to the station. Witness told him he could not do that; whereupon the prisoner said, "I'll have a go for it." He then kicked out right and left, and caught witness on the legs, and struck him several times with his fist.

Another constable said he was also severely kicked and struck by the prisoner, who was very violent all the way to the station; it required four or five constables to take him.

Other constables were called, who showed that the prisoner had been sentenced to four months, two months, one month, and several other terms of imprisonment for violent assaults, chiefly upon the police.

In answer to the charge, prisoner said nearly all that had been stated was untrue.

Mr. SLADE said the prisoner had, in a most unjustifiable manner, interfered with Jones, and assaulted him, and then attacked the police in a violent manner. For the assault on Jones he should sentence him to two months', and for the assaults on the police to four months' hard labour.

The Lighting of Courts in Birmingham.—The Public Works Committee of the Birmingham Corporation are paying close attention to the question of the lighting of courts, and have selected a number of cases for the enforcement of the legal obligations which are said to rest upon the owners of the property.

MISCELLANEOUS NEWS.

GAS WORKMEN AND THE LABOUR QUESTION.

The South Metropolitan Company and their Difficulties.

The only event to be recorded this week in connection with the dispute between the South Metropolitan Gas Company and their workmen is the demonstration held in Hyde Park in the afternoon of Sunday, the 19th inst., as briefly noticed in our last issue. It was termed a "Mass Meeting of the Trade Unions of London," and was made the excuse for sending out large numbers of men with begging-boxes in solicitation of alms in support of what was declared to be the war for "liberty against slavery." The men carrying these boxes were at all the gates of the park and in all the paths; and some carried nets on the ends of jointed sticks in order to thrust them into carriages.

As usual on these occasions, the "demonstrators" were accompanied by bands and banners; one of the latter having been specially prepared with the view of enlisting the sympathy of the public, the lack of which has been keenly felt. It bore an inscription stating that the men were on strike against a bonus scheme which required them to sign to serve the Company for twelve months in any capacity—that was to say, that they might be reduced from 6s. to 2s. 6d. a day. There were three platforms, at the first of which Mr. Mark Hutchins, President of the Gas Workers' Union, presided. He said the leaders of the movement had hoped that they would have been able to announce at that meeting the termination of the dispute. Suggestions had been held out during the week by Mr. George Livesey that if the strikers would agree to certain terms he would not force anyone to accept the bonus scheme, and that a man would be quite independent whether he signed the agreement or whether he did not. As Mr. Livesey appeared willing to withdraw the scheme to this extent, the Committee of the gas stokers and coal porters had waited upon him; but when they saw him, he did not seem to wish to enter into any terms at all. Instead, therefore, of coming to Hyde Park to tell the strikers that the dispute had been settled in a conciliatory manner, the leaders came there to ask the trades to support the strikers to the bitter end in the battle. The trades would be called together in order to see if some pressure could not be brought to bear upon Mr. Livesey, and to see whether he was to be allowed to treat them as he was doing. So far the leaders of the strike had tried to avoid anything rash; but if the weapons of poverty and starvation were brought to bear so strongly in this battle, no one present could be answerable for what the men would do. In this fight the strikers had had all classes and all people against them. The pickets had not been allowed to approach the gates and attempt conciliatory measures; and the public had been wilfully misinformed as to the position of the strikers and the state of affairs. The men were fighting for principle, and should be supported on principle. In a very short time they would have the miners and the coal trimmers federated with them; and then he doubted whether even Mr. Livesey would be able to hold out. If the trades supported them they would win the battle. Mr. W. Thorne, the General Secretary of the Union, said that as the processions had marched up the West-end the people in the club windows—people who lived on the labour of the masses—were grinning and laughing at them. The time would come, however, when these people would not be in the position to laugh and jeer at the workmen; and their time had nearly come to an end. The capitalist classes of the country were determined to break up the federation of labour; and Mr. Livesey had said that if the strikers went back to work, they would have to go back to twelve hours. They would never enter the gates to go back to twelve hours. They came out for eight hours, and would go back to eight hours; and the dignity of Englishmen would not let them go back under any other circumstances. Mr. Livesey wanted the strike declared at an end. That would be done when he met the men in an impartial manner. The strike was based upon pure and democratic ideas; and the men must keep reducing the hours of their labour, or they would never be better than when they started. Mr. Livesey said the men could come back two one day and two another. But they were not going to creep and crawl to him, and beg for work. They were fighting against such a combination of capitalists as had never been seen before, and which the Government was assisting. He believed, however, the strikers would have victory in the end. Mr. Bateman said if the Trade Unions of London would but recognize that the gas men were fighting their battle, and would stretch out the hand of friendship and assist them with monetary aid, the gas men would win. Mr. Livesey had been aided in this strike by the work of the riff-raff of the towns; but he would be beaten in the end. A resolution was then proposed as follows:—"That this meeting is of opinion that the terms of the men are reasonable, and we request the officials of the Company to meet the conciliatory terms of the men." This was adopted unanimously. At the other platforms, at which a few hundred persons were gathered, a resolution in similar terms was proposed and adopted.

Another meeting was held on Sunday afternoon last, on Deptford Broadway, in support of the men on strike. The general lament of the speakers was that the old Trades Unions had failed to recognize the importance of this strike, and had neither sympathized nor assisted in the struggle. The Chairman of the meeting (Mr. Hugh Brown, the President of the Naval and Military Temperance Society), in the course of his remarks, stated that he believed the Gas Companies of London had combined for the purpose of attempting to crush the Union. Mr. Mark Hutchins informed those present that he attended a meeting of delegates of the Trade Unions in the Assembly Hall, Mile End Road, on the previous evening; and they had promised to support the strikers. The Trades Council had intimated their intention of calling a meeting next Thursday, and had asked the Executive of the Gas Workers' Union to be present. There was no doubt, Mr. Hutchins thought, that they would do their utmost to stand by the Union in this struggle. He also mentioned that at a meeting that morning of the Executive Council, they had determined to send delegates to country places to educate the agricultural labourers, and prevent them coming up to London when the men at the gas-works were on strike. This, as a later speaker remarked, looked very much like locking the stable door after the horse had been stolen.

THE RECENT STRIKE AT THE MANCHESTER GAS-WORKS.

At the Meeting of the Manchester City Council last Wednesday—the Mayor (Mr. Alderman Mark) presiding—the Gas Committee reported that the various gas stations were fast assuming their normal condition; and the men employed were rapidly adapting themselves to their new calling. They went to their respective homes, and were treated in every way as the old hands would have been if the strike had not taken place. The Committee desired to place on record their high appreciation of the loyal manner in which they had been supported by their colleagues in the Council in the discharge of their onerous and unpleasant duty, and further expressed their thanks to the general public for their moral support and forbearance. Mr. Alderman Lamb, in moving that the proceedings of the Committee be approved, said he could only tell the Council that they were working very quietly, and since the last meeting had been making more gas than was wanted. He begged to thank Sir John Harwood and the Committee generally for the manner in which they had acted during the time that the strike was going on. The Committee were very sorry that any of the public should have suffered by the annoyance and expense to which they had been put; and he believed that now many of the men were themselves as sorry as the Committee that they had been led away by misrepresentation. He trusted that neither the men nor the Committee would ever have cause to enter into similar proceedings in order to get a good supply of gas in the future. His only regret was that the sorrow and suffering which had fallen on the men and their families had not fallen on the heads of those men who gave the advice which led to the strike; and he hoped that the lesson they had learned would last the men a lifetime. The proceedings were approved.

THE PROPOSED PURCHASE OF THE CANTERBURY GAS AND WATER WORKS BY THE TOWN COUNCIL.

A Special Meeting of the Canterbury Town Council was held last Thursday—the Mayor (Mr. W. W. Mason) presiding—to discuss a further report of the Sub-Committee charged with the consideration of the Gas and Water Company's Bill.

The Mayor said the special business for which they had met that morning was connected with the report of the Sub-Committee appointed to discuss with the Directors of the Gas and Water Company the desirability of the Council purchasing their undertakings. He need hardly say this was about the most important project which had ever engaged the attention of the Council; and he hoped the members would give it their most earnest consideration, because he believed, if they were successful in negotiating the purchase, it would ultimately be for the mutual benefit of the citizens of Canterbury.

The Town Clerk then read the report of the Sub-Committee, which first stated that they had a meeting with the Directors of the Company at the gas-works on the 20th inst., when the following terms for sale by the Company of the gas and water undertakings were unanimously agreed to as those to be submitted for approval to the shareholders on the one hand and the Corporation on the other:—"That the terms of the sale and purchase shall be settled by two competent Referees, being gas engineers, one to be nominated by the Company and the other by the Council, with power for such Referees, in case of difference, to appoint an Umpire. That should either contracting party be unable to complete the contract after the commencement of the negotiations for determining the price to be paid for the undertakings, the party making default shall pay to the other the costs and expenses which shall have been incurred by the other party during the negotiation."

Mr. S. Prentice, the Chairman of the Sub-Committee, said that in accordance with the resolution passed by the Council at their previous meeting, the Committee met the Directors of the Company; and he would, on behalf of his fellow members, acknowledge the courtesy and kindness with which they were received. The matter was thoroughly discussed; and in order to obtain every possible information, he asked the Chairman whether it would be feasible for them to mention any probable sum that they thought the undertakings would cost. He (Mr. Prentice) did this, not that he thought it was possible for them to do so, but he took as an example the action of the Ramsgate Corporation, by whom the Directors of the Gas and Water Company in that town were induced to mention an amount which, however, the Corporation declined to give. He (Mr. Prentice) thought that if they could get a sum mentioned, it would enable them that day to go more fully into the benefits they would derive in taking over the undertakings. But the Chairman said he hardly saw how they could do so, on the ground that their shareholders might afterwards complain that they had not asked a sufficient sum, and the ratepayers, on the other hand, might say they required too much. The result was that they had unanimously adopted the resolution which had been read, and which he thought every member present would say was the only fair course to be pursued under the circumstances—that was, by reference to Arbitrators. This resolution was unanimously adopted by the Directors and the Sub-Committee, and they came that day to the Council to ask their consent to this course being adopted. As he said before, they could not say what amount was likely to be gained by the Corporation taking over these undertakings; but they had gone into figures in their minds, and had come to the conclusion that there would be a very fair surplus left after payment of all expenses. They looked back at the successful way in which the undertakings had been carried on for many years by gentlemen connected with the Company; and if the same oversight and care were given to it by the Corporation, he saw no reason why it should not be as successful in their hands. There would also be a saving of the sums yearly paid by the shareholders to the Directors. Then, again, they were using some £400 worth of water every year in street watering and sewer flushing. This, subject to the expense of raising the water, would be a great saving to the city. Looking at the matter in a fair and reasonable way, there would, if the undertakings came into the hands of the Corporation, be a substantial surplus to deal with, either in the reduction of rates or in any other way

the Council might think proper. The Committee felt they could not do anything in the way of objecting to the clauses of the Company's Bill, until this matter had been settled; and, therefore, they placed it before the Council in the hope that they would seriously consider it, and that steps would be taken to acquire the undertakings. He would say that to the resolution read by the Town Clerk there must be added a stipulation, making it subject to the sanction of the Local Government Board. He begged to move the adoption of the report.

Captain LAMBERT, in seconding the motion, said he felt as a citizen of Canterbury and a member of the Corporation, that they owed a debt of gratitude to the Sub-Committee, and especially to Mr. Prentice, for bringing this matter forward. With regard to the question of borrowing money, they would have to go to the Local Government Board; and he believed it would entail a considerable lapse of time before they could acquire the powers they wanted.

The TOWN CLERK said they could only commence parliamentary proceedings in November.

Mr. CROSS, in supporting the resolution, said he might mention, in addition to what Mr. Prentice had stated, that not only did they use £400 worth of water a year, but also £1600 worth of gas. Their annual gas and water bill therefore amounted to something like £2000; and if the undertakings were in their hands, they would obtain both at first cost. The number of boroughs that had taken over such undertakings was very considerable; and he thought in almost every instance it had proved a great success. He would, however, have liked to have had more time to consider this question; but, of course, this was impossible. In the Company's Bill, there were a number of clauses which, if passed into law, and the property remained in the hands of the Company, would be prejudicial to the citizens; and it would probably be necessary to oppose these clauses if the question of purchase were not entertained. Another question would arise as to whether, in the event of the Corporation purchasing the undertakings, the Bill should be allowed to pass, and the powers conferred by the measure be transferred to the city. If the Bill were allowed to pass, and the Company retained the property, it would be useless to think of purchasing, because they were asking permission to raise a large amount of additional capital—something like £75,000—and were seeking various other powers, which would seriously affect the interests of the citizens. Considering the Bill and the prospective advantages to the city by becoming the owners of this property, they need not hesitate to adopt the proposal made by Mr. Prentice.

Mr. HARRIS said it struck him whether it would not be well to go to a little expense to ascertain the real state of the Company's plant, so that they might know whether any great expenditure on the works would be necessary in the course of a few years.

The MAYOR remarked that, as regarded the condition of the plant, the Corporation would have simply to employ a competent gas engineer, whose particular business it would, of course, be to look after their interests, and put a fair value upon the undertakings.

Mr. SANDERSON pointed out that if the Company obtained their Bill, the shares would become more valuable, and the Corporation would be called upon to pay a higher price.

Mr. HARRIS said that question was put to the Chairman of the Company; and he told them that three-parts of the expense of the Bill had already been incurred, and that, if they came to terms in a week or two, the Company would carry the Bill through on behalf of the Corporation, who would have, as purchasers of the concern, all the benefits. It would be hardly the thing to oppose the Bill if they were going to purchase the works.

Mr. CROSS observed that if they decided to oppose the Bill, it must be done at once; but if they did so, they must give up all idea of purchase. To oppose the Bill would involve a very considerable outlay; indeed, it might lead to an expenditure of thousands of pounds. By opposing it, they might get certain clauses altered. One in particular would be very objectionable if allowed to pass—viz., that referring to the sliding scale. The value of the shares would by that clause be increased from 8 per cent. to (possibly) 11, 12, or even 15 per cent. The result would be that the property would increase so much in value, that it would not be to the interest of the citizens to purchase.

The MAYOR said the Chairman of the Company stated that, in the event of a purchase by the Council, the Company would not take any advantage of the Bill if it were allowed to pass; so that the purchase price would not be increased.

The TOWN CLERK remarked that, he understood if an agreement were arrived at, and the Bill passed by consent, the Company might ask the Council to bear a certain proportion of the expenses, but they would not make a claim to enhance the value of their undertakings.

Mr. HARRIS said that if the shareholders of the Company agreed to the terms offered by the Council, the concern would really become the property of the city.

Mr. PRENTICE, in reply to Alderman Mount, stated that at Ramsgate the gas undertaking cost £106,000, and the water-works £100,000. Continuing, he remarked that the Sub-Committee had taken a given sum; and calculating at a fair and reasonable rate of interest, they found there was a very fair surplus.

Mr. MILLS believed the purchase would be for the benefit of the city; and that it would ultimately prove a success.

The resolution was then put, and carried unanimously.

A Gas-Main on Fire at Edgbaston.—An alarming occurrence took place a few days since at Edgbaston. Some men employed by the Gas Committee of the Birmingham Corporation were engaged repairing a 16-inch main; and a portion of the pipe had to be chipped out in order to allow a valve to be placed in position. A spark from a fire which was burning near was blown on to the escaping gas; and a large conflagration ensued. The Fire Brigade was summoned; but pumping water on the flames was found to be useless, and it was decided to cover the pipe with rubbish. Two cartloads of *débris* were tilted into the hole; and the fire was thus extinguished. The flame at one time reached a height of 20 feet. One of the workmen had his clothing partially destroyed by the flames; and another man was overcome by the fumes of the gas.

PARA GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Thursday, at the London Offices, 16, St. Helen's Place—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. T. S. Borradaile) having read the notice convening the meeting, it was agreed to take as read the Directors' report and the accounts, the chief points in which appeared in the last issue of the JOURNAL (p. 116).

The CHAIRMAN, in moving—"That the report and the accounts of the Directors to the shareholders, as presented, be and are hereby approved and adopted," said he was afraid the tone of the report might be somewhat disappointing to the proprietors; seeing it was stated that the results of the working had not been as good as the Directors could have wished. This was owing principally to the fact that the improvement in private lighting had not been what they expected. Latterly their policy had been to supply gas of a somewhat better illuminating power than previously; and the Board had hoped this would have tended to stimulate the consumption by private consumers. Up to the present time this had not been so; but he thought it possible it might have that effect in the future. They had at Pará a competitor in the shape of kerosene oil; but he believed they would overcome it, as the inhabitants became aware of the improved quality of the gas. Coke had not produced such satisfactory results as anticipated. He should like to mention, as an instance of the way in which the works had been conducted, that they had just received a letter from their Manager (Mr. J. G. Newbigging), in which he stated that his yield of gas per ton of coal carbonized had been 11,820 cubic feet. There was one thing with which the Board were perpetually hampered, and that was the old, familiar story of the debts of the Government not being paid. They had been untiring in their exertions to get the Government to pay these; but only a small arrear had been paid lately. There had, as the shareholders knew, recently been a change in the Brazilian Government; and he trusted the old saying that "a new broom sweeps clean" would be true in this case, and that they would get their accounts paid quicker than under the imperial *régime*. The Directors had taken every step they possibly could with a view to stimulating the authorities to give the Company their dues. They had been so far as to request the assistance of the Foreign Office, who had been kind enough, unofficially, to bring a little pressure on the Imperial and Provisional Governments. If it were not for these debts, the Board would be in a position to pay the dividends which were declared some time ago. However, he was happy to say that of late money had been coming in better than they had anticipated; and they hoped very shortly—perhaps on the 15th prox.—to be able to pay the dividend last declared. Although they had the money on paper, the Directors did not think it wise to declare another dividend until they had it in hand, as it rather saddled them to have a dividend which had been declared hanging round their necks unpaid. When they obtained sufficient funds, he was sure the shareholders would not object to be called together to declare a dividend. Indeed, since the report was issued to the proprietors the state of their finances had so far improved that they were ready to pay the preference shareholders their dividend. It would be necessary, however, as the matter was not mentioned in the advertisement calling the meeting, to adjourn for a fortnight, in order that the shareholders might have notice of the intention of the Board to pay this dividend. Adverting to the change of Government in Brazil, the Chairman stated that, judging from their present experience, the Directors hoped to get better treatment from the present than the last Government; and they had every reason to believe that they would keep their engagements. Their Manager had received a letter from the Provisional Government in which they said: "In reply to your official letter, dated Nov. 23 last, this Council has to declare to you that the Government will faithfully respect all contracts, doing their utmost that all the clauses contained in them may be fulfilled, and will provide that the Company be opportunely indemnified the amount owing to them by this State." With regard to the question of a new concession, which the Board hoped to get from the Government, the Chairman said that the old concession had not now very long to run; and it was desirable it should be renewed as early as possible. This had caused them considerable trouble, care, and anxiety. They considered the lines of the old concession must be modified, as they were not disposed to take a concession under the same conditions, while the Company were supplying gas of a far better quality. The Board were giving constant attention to this matter; and if they obtained a new concession, he was sure it would be one that would be acceptable to the shareholders. Having referred to the satisfaction of the Directors in regard to the ability and good judgment shown by the Manager in his conduct of the business in Pará, he said that they regretted to announce the retirement from the Board of their late Chairman (Mr. Robert Morton), who had felt compelled to take this step owing to his many other engagements occupying a very large portion of his time. In his place, they had elected Mr. C. W. C. Givens, who was thoroughly qualified for the position.

Mr. DODGSON seconded the motion.

Mr. LAMBERT said that, as a large shareholder, and as an old Director of the Company, the report and accounts were very disappointing to him. They were disappointing because they saw all their neighbours were doing so exceedingly well. With a revenue of about £27,000, the net profit which was shown in the accounts (something like £6000 or £7000) was quite inadequate. He considered that there was one weak point in the administration of the Company; and that was the want of a proper control and knowledge of what was going on in Pará. He believed he was right in saying that since Mr. Wilson went to Pará some six or seven years ago, no one had been over there from the Board to see how things were going on. He proceeded to strongly urge upon the Directors the necessity of someone being sent regularly to report upon the condition of the business and the property; and he hoped the Board would undertake, before the meeting closed, that a Director or an Engineer should be sent out at intervals for that purpose. He hoped his remarks would not be regarded as inimical by the Directors.

Mr. BLUNDELL, the Rev. Mr. SNOWDEN, and Mr. R. G. COOPER all

concurred in the remarks of Mr. Lambert, and hoped the Board would give their serious attention to the matter.

Mr. DODGSON suggested that perhaps four or five Brazilian companies could be found who would combine in sending out, at stated periods, a professional man to report upon their respective properties.

The CHAIRMAN said they had much confidence in their present Manager, who conducted the affairs of the Company with great skill. The matter which had been brought forward by Mr. Lambert had been often discussed by the Board; but nevertheless they were glad it had been again mentioned, and he could give his assurance that it should have renewed consideration. As to a Director going out to Pará, he was afraid it would be difficult to find one who would care to go; but when a vacancy on the Board occurred, they would be glad to receive the name of a shareholder who would undertake to visit Pará.

After some further discussion of a similar nature on the subject,

The two Directors retiring by rotation (Messrs. A. H. Henry and C. W. C. Givens) and the Auditor (Mr. P. Crellin) were re-elected.

On the motion of the CHAIRMAN, seconded by Mr. DODGSON, a resolution was passed, adjourning the meeting until Thursday, Feb. 6, when it is the intention of the Directors to propose that a dividend be paid at the rate of 7 per cent. per annum on the preference shares for the half year ending Sept. 30.

The usual complimentary vote having been passed to the Chairman and Directors, the proceedings terminated.

LOTHAMMER GAS COMPANY, LIMITED.

A Meeting of the above Company was held at the Offices, No. 6, Lombard Court, E.C., last Thursday—Mr. C. E. PARKER RHODES in the chair—to consider the possibility of arriving at a settlement as to the vendor's shares, and to hear what the holders of these shares, independently of Mr. Lothammer, had to propose.

Mr. BAGOT HARTE said he had seen Mr. Nokes; and they were both of opinion that the Chief Clerk in Chancery would not consent to anything except that all the vendor's shares should be in the same boat. Mr. Nokes's suggestion was that one-third of the net profits should go to the cash shareholders, and two-thirds to the vendor shareholders. They had to look at the matter in this way: They had two sets of officials to deal with—the Official Liquidator, and the Chief Official Receiver for Colonel Murray, the order for whose bankruptcy had just been filed. The question might be raised whether some of these things could not be set aside, so as to effect a settlement without litigation; and they wished to put forward some basis that would be acceptable to everybody, as well as to the officials of the Court, who had not to look at the interests of the cash shareholders of the Company, but those of the particular people who were then before them. If the cash shareholders had one-third of the profits, and the vendor shareholders two-thirds, it was very fair to the former, as they obtained more than they anticipated. He understood that Mr. Lothammer was willing to yield on these terms. He suggested that Messrs. Nokes, Stammers, and himself should draft some agreement, and see whether it could be carried through.

Dr. ALEXANDER said if the holders of vendor's shares were willing to take half of the profits after 10 per cent. had been paid on the preference shares, they would be more pleased to have two-thirds; and he did not anticipate any difficulty there. He could not see what was the use of having a paper agreement, which would not advance them a single inch. Nine out of every ten would rather lose the preferred shares they had than get them on condition of finding further capital; and if they were going to get £1000 or £2000 of additional capital, they would be having all sorts of complications, legal and otherwise. If Mr. Lothammer had disposed of some of his shares to his friends, and was now dissatisfied with the proportion he held, that was his own look-out; and he ought not to pose as an object of sympathy. They had to consider the future of the Company.

Mr. STAMMERS, who appeared for Mr. Lothammer, said that the shares had gone in promotion, and were not given to friends. Mr. Lothammer, he believed, held about a quarter of the issued shares; and he put forward a scheme which he hoped would meet with general approval.

Mr. HARTE remarked that the Receiver in Chancery would not agree to Mr. Lothammer's shares being treated differently from any of the other vendor's shares.

The CHAIRMAN, after asking if Dr. Alexander and Mr. Harte had a conclusive document to be submitted to the cash-paying shareholders, and receiving an affirmative reply, took it as it was. The Board, he said, were quite prepared to consider such a scheme; and, in doing so, it was their duty to act for the cash-paying shareholders. The vendor stood alone. The proportion of vendor's shares to the number of shares subscribed by the public was of very little consequence; and he and the other Directors wished to act in fairness to all.

A discussion followed, in which Dr. Alexander promised to send a draft scheme to Messrs. Nokes, Stammers, and Co. for their consideration; and this was afterwards to be laid before the Board.

The proceedings then terminated.

The Lighting of Streets in Newcastle.—At a meeting of the Lighting Committee of the Newcastle Corporation last Wednesday, a deputation which had been appointed to wait on the Directors of the Gas Company in regard to the price charged for the gas supplied to the street lamps reported the result of their interview. It was to the effect that up to a year ago a discount of 15 per cent. had been allowed on the account relating to the lighting of the streets. Since then, owing to the partial lighting of the streets during the summer months, and the increased price of coal and labour, the Directors had been obliged to reduce the discount to 5 per cent. As a result of the interview, however, it was agreed to allow 7½ per cent., on the understanding that the whole of the street lamps would be kept burning at night all the year round. It was agreed that the offer of the Company should be accepted, subject to certain formal arrangements being come to. In the course of the proceedings, the Committee intimated their intention of trying a small experiment in electric lighting.

BRADFORD CORPORATION ELECTRICITY WORKS.

Local Government Board Inquiry.

Last Friday week, an inquiry was held before Mr. T. Codrington, M. Inst. C.E., one of the Inspectors of the Local Government Board, accompanied by Colonel C. H. Luard, R.E., into an application by the Bradford Corporation for powers to borrow £30,000 for the purposes of electric lighting. The Council originally authorized the Gas and Electricity Committee to apply for powers to borrow £25,000 for the electric light works; but powers were only asked for £20,000. About £2000 beyond the latter amount, however, has been actually expended; and the £30,000 with regard to which the inquiry was held is intended to cover that sum as well as the expenses of future extensions of the works. The immediate expenditure at present contemplated is only £10,000; so that, if the application is granted, the Corporation will be able to proceed with additional works from time to time without being put to the inconvenience of repeated applications to the Local Government Board. The works which the Corporation have at present in view were explained by Alderman F. Priestman, the Chairman of the Committee, at a recent meeting of the Council, as reported in last Tuesday's JOURNAL. No opposition was raised to the application. The Inspector first required, and was supplied with, information relating to the expenditure of £20,000 for which authority had been previously given by the Board. Plans were also produced showing the places where the works and wires had been laid down; and the expenditure incurred to the present time was accounted for. The next inquiry was as to the sums of money which the Corporation had already obtained powers to borrow by way of charge on the general district rate. It appeared, from information furnished by the Town Clerk (Mr. W. T. M'Gowen), that the Corporation might, under existing powers, borrow upon the rate to the extent of £2,000,000, but had at present only borrowed somewhat over £500,000. There was therefore, the Town Clerk submitted, an ample margin for the loan now sought. The Inspector then went on to investigate the ground on which the present application was founded. Mr. Shoolbred, C.E., Consulting Electrical Engineer to the Corporation, produced plans of the proposed works, and estimates of their cost. At the conclusion of the inquiry, the Inspector and Colonel Luard visited the electric works, with the character of which they expressed great satisfaction.

THE PROPOSED ELECTRIC LIGHTING OF ST. PANCRAS.

Report by Professor H. Robinson, M. Inst. C.E.

The following is the report (referred to in our "Electric Lighting Memoranda" to-day) upon which the St. Pancras Vestry recently resolved to invite tenders for the electric lighting of the parish. It will be noticed that two schemes are referred to; but as the Vestry have adopted No. 1, the figures relating to the other have been omitted.

Gentlemen,—Mr. Thomas Eccleston Gibb [the Vestry Clerk] has thought that your convenience would be best met by my submitting to you in detail the cost of the two alternative installations of 10,000 and 5000 lights, which were suggested in my report of March last. The installation of 10,000 lights I will call scheme No. 1, the central station being in King's Road; and the installation of 5000 lights, with the central station in Edward Street, I will call scheme No. 2. At your meeting on the 14th of October, the desirability of subdividing the contracts under several heads was referred to; and I stated that this would effect economy in carrying out the works. As I understood that you wished my estimates to be confirmed by tenders, I have gone very fully into the arrangement of the engines, boilers, dynamos, batteries, transformers, mains, &c., and have obtained provisional tenders from various leading manufacturers on which the figures hereinafter given are based.

The following is a description of the general arrangement of the works, and of the system of producing and distributing the electric current. I propose to supply the consumers with a continuous current, at a tension of 110 volts. The immediate neighbourhood of the central station will be supplied by a low-tension—110-volt—dynamo, feeding direct into the distributing-mains; and the distant portions of the district will be supplied by sub-stations placed to suit the demand. The power will be transmitted from the central station, where it is generated, to the sub-stations, by a constant continuous current, at a tension varying, according to the demand, from about 500 volts to a maximum of 3000 volts. This high-tension primary current will drive continuous-current transformers at the sub-stations, and will produce secondary low-tension currents, which will be fed into the distributing-mains. There will be a reserve of storeage batteries, always charged, at each sub-station, which can be available as a stand-by in case of any sudden demand. The total amount stored will be about 800 units in No. 1 scheme, for 10,000 lights; and about 460 units in No. 2 scheme, for 5000 lights.

The cost of producing a unit of electricity depends upon the size of the installation and upon the number of hours the lamps are used per annum; and I have prepared a table to show this, in order that you may see clearly the advantage of commencing with an installation of 10,000 lights, instead of with one of 5000 lights. I have based my calculations upon the very liberal assumption that every additional 5000 lights, beyond 10,000, will cost the same as the second 5000 lights. The first column gives the number of 16-candle power incandescent lamps which the plant is capable of serving simultaneously. The number of lamps which may be safely installed will be considerably more than these, as it has been found in practice that the maximum number in use at one time lies somewhere between two-thirds and three-fourths of the number of lamps installed. The number of units sold per annum is taken at 80 times the number of lamps given in the

first column for the first two cases, and then in diminishing proportion down to 70 times in the last case.

Number of Lamps of 16-Candle Power.	Cost of Producing One Unit (excluding Sinking Fund.)
5,000	3·27d.
10,000	2·80
15,000	2·70
20,000	2·70
30,000	2·70

In calculating the above table, I have taken non-condensing engines as being employed at the central station, which are less economical than condensing engines. The latter use about 25 per cent. less steam—saving, therefore, that percentage of coal and stoking; and this with the reduction in the depreciation of boilers, &c., represents about ¼d. per unit. If condensing engines are employed, the above figures, therefore, would be reduced by 0·25d. The additional cost per unit to provide for the sinking fund may be safely taken at ¾d. in all cases; so that, after making due allowance for the sinking fund, the cost per unit will never exceed 4·02d. with non-condensing engines, or 3·77d. with condensing engines. These figures are arrived at after the details have been gone into, and may be accepted in place of the 4¼d. per unit which I gave in my report of March. In my report of May, I gave the price of an incandescent lamp up to 16-candle power as 5s. I find that the present price of these lamps is 3s. 9d.; and this reduction in the cost of the lamp reduces also the cost of the renewals by a similar 25 per cent.

Taking scheme No. 1 (for 10,000 incandescent lights of 16-candle power and 40 arc lights of 500 watts), the machinery at the central station is arranged for a maximum rate of output of 600,000 watts, delivered through five sub-stations, and 50,000 watts delivered direct to the mains, or a total output of 650,000 watts, which is equivalent to about 550,000 watts delivered to the lamps. The 10,000 incandescent lights will absorb 530,000 watts; leaving 20,000 watts to serve 40 arc lamps in the streets. There will be five sub-stations, arranged to supply as follows:—No. 1, near the top of High Street, Camden Town; No. 2, near the middle of Albany Street; No. 3, near the south end of the Hampstead Road; No. 4, near George Street; No. 5, in or near Gordon Street. The following is the estimated cost of No. 1 scheme:—

Central Station.

Buildings—Engine and boiler houses, foundations, offices, &c.		£3,250
Tank for condenser water		540
Machinery—		
Five sets of Willans's II engines, combined with Siemens's 120-unit dynamos	£7750	
One set of Willans's GG engines, combined with Siemens's 50-unit dynamo	800	
One 60-unit transformer	500	
Three boilers	2250	
Surface condenser apparatus	1000	
Pumps, Mains, cooling apparatus, and crane	1050	
Regulating gear, electrical connections, &c.	1000	
		14,350
Total cost of central station		£18,140

Sub-Stations.

No. 1.—One 60-unit and two 30-unit transformers	£1100	
Batteries for 160 units	800	
Fittings and foundations	100	
		£2,000
No. 2.—Two 30-unit transformers	600	
Batteries for 160 units	800	
Fittings and foundations	80	
		1,480
No. 3.—Four 60-unit and one 30-unit transformers	2300	
Batteries for 160 units	800	
Fittings and foundations	300	
		3,400
No. 4.—Same as No. 1		2,000
No. 5.—Same as No. 2		1,480
Total cost of sub-stations		£10,360

Mains.

½ mile with 2 square inches in each conductor	£1,725
½ " 1½ " " "	1,425
1 " 1 " " "	2,250
1 " ¾ " " "	1,950
1 " ½ " " "	1,650
2 " ¼ " " "	2,500
Extra for divided main—*i.e.*, separate feeders—in ½ mile of above, at 3s. per yard	130
Extra for house junction T-pieces, six-miles, at £66 per mile	400
265 surface-boxes or man-holes	800
High-tension mains, 9350 yards, at 8s. 6d.	3,880
Total cost of mains	£16,710

Summary of Cost of Scheme No. 1.

Central station	£18,140
Five sub-stations	10,360
Six miles of mains	16,710
	£45,210
10 per cent. for contingencies	4,521
Total	£49,731

It will be noticed that the length of distributing mains included in the above estimate is six miles—or 10,560 yards—and 9350 yards of high-tension main. This latter length includes the return wires; and is therefore only equivalent to 4675 yards of double main. Adding this to the 10,560 yards of distributing-mains, gives a total length of 15,235 yards, against the 22,000 yards stated in the report of May. The reason for the difference is that the six miles of distributing-mains in the present estimate are made large enough to convey electricity to serve 25,000 lights working simultaneously, which, in my opinion, will be found to be the demand upon them. If the mains are laid at the outset of a size only to serve 10,000 lights distributed over the greater length of 22,000 yards of mains, their capacity will very soon be overtaxed; and it will then be necessary to take them up and lay larger ones, or to put down long lengths of additional feeders, at a cost which can be avoided by laying the mains suggested. Small branch mains to serve 50 to 150 lights up side streets, where the demand is not likely to increase rapidly, can be laid at a cost of about £900 per mile.

The cost of running the arc lights will be as follows:—

500 watts acting for 3808 hours per annum = 1904 Board of Trade units, at 3¼d.	£27	15	4
Carbons and lamplighter	10	16	0
Total	£38	11	4

40 lamps, at £38 1s. 4d. = £1542 13s. 4d. per annum.

These lamps would replace about 200 ordinary gas-lamps, which now cost £560 per annum; so that the increase in cost would be £982 13s. 4d. per annum, but with an increase of 14 times the present light. The prime cost of the 40 arc lights, if erected in the cheapest possible manner, would be about £1000; or with ornamental posts and shelters, about £3000.

Annual Cost of Scheme No. 1 with Production of 825,000 Units.

Rent—Central station (ground)	£105	
Five sub-stations (cellars)	300	
	(say)	£400
Depreciation of plant, &c.		3400
Salaries—Engineers, assistants, and clerks		1100
Labour—Engine drivers, stokers, &c.		1500
Coal—2830 tons, at 17s. 6d.	(say)	2500
Water, oil, waste, and petty stores		500
Total annual cost		£9400

To produce 825,000 units, or nearly 2¾d. per unit.

Annual Cost of Scheme No. 1 with Different Rates of Production.

Fixed expenses—	
Rent	£400
Depreciation of plant	3400
Salaries	1100
Part of labour, coal, water, oil, stores, &c.	1100
	£6000

Annual cost when producing—

400,000	units =	£7666, or 4·60d.	per unit.
500,000	" =	8083 " 3·88d.	"
600,000	" =	8500 " 3·40d.	"
700,000	" =	8916 " 3·06d.	"
800,000	" =	9333 " 2·80d.	"
900,000	" =	9750 " 2·60d.	"

If the current is used for motive power to any considerable extent, the plant will be able to meet a larger demand, as the motive power will be required at times when the machinery is not under full load for lighting purposes; and this will increase the revenue in a higher proportion than the working expenses—so much so that it might be well to encourage the demand for motive power by supplying the current at a lower price for that purpose.

A PUBLIC LIGHTING QUESTION AT CHRISTCHURCH (N.Z.).

According to information just received from an esteemed correspondent in New Zealand, we learn that a dispute which has lately been pending between the Christchurch Gas Company and the City Council has been satisfactorily settled. It appears that on Nov. 13 last year a conference took place between some of the Directors of the Company and the Special Lighting Committee of the Council in reference to the gas supply of the city, more particularly in connection with the public lighting; and the outcome was the submission by the Company, on the 15th, of certain proposals which they understood embodied the views of the Committee. They were as follows:—(1) That in consideration of the meter-rents being abolished, and the charge for lighting the public lamps reduced from £5 to £4 4s. per annum, the City Council would enter into a contract with the Company for lighting the city upon these terms for three years. (2) The Council on their part to abstain from promoting opposition gas-works during the currency of the contract, and for a further period of four years from the expiration thereof. (3) That upon the expiration of the three years, the City Council were to be free to light the streets by electricity. The Directors expressed their willingness to accept these proposals, to enter into an agreement accordingly, and to supply gas having an illuminating power equal to 17 standard sperm candles. A few days after the receipt of the foregoing proposals, the Company were informed that the Committee would recommend the Council to accept the terms, provided the words in the second clause, pledging them to abstain, for a period of four years from the expiration of the contract, from promoting opposition gas-works, were struck out, which would render unnecessary the third clause. On the following day, the Chairman of the Company (Mr. E. G. Wright) sent to the Committee a letter in substitution of the one containing the proposals in their original form; and in this the second clause read as follows:—"The City Council to abstain from promoting opposition gas-works." It was then pointed out by the Mayor that the words "during the currency of the contract," which appeared in the Company's letter of Nov. 15, had been omitted from their substituted letter. On these words being reinstated, the proposals could, he said, be recommended to the Council for adoption. This brought from the Chairman of the Company a reply, in which he stated that, while the Board had every desire to give effect to the arrangement mutually proposed at the conference between the Lighting Committee and representatives of the Company, they regretted that, in justice to the shareholders, they were unable to make any further concession. He reminded his Worship that, after a full discussion, the Lighting Committee agreed that if the meter-rents, were abolished and the charge for lighting reduced from £5 to £4 4s. per lamp, the Council would enter into a three years' contract with the

Company, and abstain from promoting opposition gas-works during the currency of the contract and for four years subsequently. As a set-off to this arrangement, the Committee stipulated that the Council should have the right to adopt a system of electric lighting at the end of the three years' contract. It was pointed out during the discussion that the Company's concessions would entail a loss to the shareholders of £1500 a year; and only the prospect of remaining undisturbed for a lengthened period warranted the Directors in consenting to this large additional reduction. These terms were embodied in their letter of Nov. 15; and he gathered from the reply that the Mayor desired to leave indefinite the term beyond three years during which the Council were to abstain from promoting opposition gas-works. Mr. Wright concluded: "My Board being anxious that no small difficulty should stand in the way of an amicable settlement, directed me to accept the slight modification which they understood you desired; but it appears from your last letter that you now propose to limit the Council's abstention from promoting opposition gas-works to three years only. I trust, however, that the many concessions we have agreed to will be sufficient assurance to both you and your Council that my Board are desirous of arriving at a friendly solution of our long-standing difficulty, and hope that your Council will give effect to the proposals agreed to at the meeting of Nov. 13." On the 7th ult. the Committee replied that they could not agree to the seven years' restriction, and must report to this effect to the Council. This they accordingly did at the meeting on the 9th ult. The Mayor having explained the position of the matter, a motion for the adoption of the Committee's report was submitted, and gave rise to a long discussion. The mover (Mr. Manning) remarked that the impression left on his mind after the conference was that the contract was to be for three years in all. He thought that the Council had treated the Gas Company very fairly. Mr. Gray said he differed from the majority of the Committee, and reserved to himself the right to take any action he might think necessary. He moved, as an amendment, that the final clause of the report of the Committee should read as follows:—"Your Committee would recommend the Council to agree to the terms named in the Gas Company's letter of Nov. 15, on condition that the Company give a guarantee that the price of gas to private consumers should not exceed 7s. 6d. per 1000 cubic feet, and that the Council have the right of renewal of the contract for lighting the street lamps if necessary for one or more years at the price mentioned—viz., £4 4s. per lamp per annum." Mr. Reese seconded the amendment. Mr. Goss said he did not think the amendment necessary. The question was whether or not the Council would accept the proposal to forego agitation for a further period of four years; and he hardly knew which way to vote. He had left the conference with the impression that the Council were not to be bound for more than three years; but he did not believe the Company would think of raising the price at the end of three years. He would therefore support the proposals the Company put in rather than see the matter locked up again for an indefinite period. He moved, as a further amendment, that the Council should accept the Company's terms. Mr. Gray then withdrew his amendment, and seconded that of Mr. Goss, which on being put was carried by 8 votes to 4.

A Water Supply Dispute at Matlock.—The Matlock Water-Works Company brought an action in the Wirksworth County Court last Thursday, against Messrs. Davis and Son, hydropathists, of Matlock Bank, to recover £41, amount due for water supply. The claim was resisted on the ground that defendants had a right to a free supply of water reserved to them by the Matlock Water Act of 1860. Finding it impossible to finish the case that day, his Honour suggested that they should devote a special day to it in February, and hold the hearing at Matlock Bridge, which course was eventually adopted.

Sales of Shares.—Last Wednesday a number of shares in the *Sevenoaks Gas Company* were sold by public auction. Original fully-paid £10 "A" shares realized £22 10s., and a few £23 each; fully-paid £10 "B" shares sold at £15 each; and a number of similar shares (£8 paid) produced £12 10s. each. There was also submitted to competition £100 of 5 per cent. debenture stock, which fetched £116. The shares were sold with dividends accruing since July last.——A sale of stock in the *Newport (Mon.) Gas Company* took place last week, when the £140 consolidated ordinary "B" stock fetched 145 per cent., and the £80 consolidated ordinary "C" stock, 135 per cent.

The Leeds Corporation and Electric Lighting.—After much delay the Parliamentary, the Electric Lighting, and the Sub-Highways Committees of the Leeds Corporation have together decided to recommend the Council to refuse their consent to the granting by the Board of Trade of Provisional Orders, authorizing the construction of electric lighting works by various Companies in the borough; and, further, "at the end of six months referred to in the resolution passed on the 2nd of October, to instruct the Electric Lighting Committee to report upon the question of electric lighting, with full information upon all improvements which have been made in supplying the light up to that time." The Mayor has convened a special meeting of the Council for next Tuesday to consider the question.

Opposition to the Falmouth Gas Bill.—According to the *Western Morning News*, notice of opposition to the Bill now being promoted by the Falmouth Gas Company for increased powers has been given by the Town Council and Local Board of Falmouth, by the Town Council of Penryn, and by Mr. Bennetts, the owner of the existing gas-works at Penryn. As far as the Penryn Corporation are concerned, the objection raised is against the borough being included within the limits of the proposed Act. The Company, in reply to a communication from the Town Clerk of Penryn, stated that the sole object of including the old borough was that in the event of Mr. Bennetts' works coming in the open market, and the Corporation declining to purchase, the Company might not be precluded from making an offer for them. It is thought possible, from what has lately taken place, that the Company will expunge all reference to Penryn from their Bill, and thus save expense. As regards the town and parish of Falmouth, however, the case is different. There are several clauses in which it is contended material modifications should be made; and the necessary steps are being taken to oppose the Bill.

THE MINERAL OIL TRADE OF THE PAST YEAR.

The extent to which mineral oil now enters into competition with coal gas as an illuminating agent gives special value, as far as gas managers are concerned, to any statistics bearing upon this product. We therefore reproduce, from an article which appeared in a recent number of the *Scotsman*, the following particulars as to the progress of the oil trade last year.

The year 1889 opened with an appearance of prosperity, and it was generally believed that the rapidly increasing demand for oil and candles would react beneficially upon the producers in Scotland. All that was known of the trade confirmed this view. The main factor to be reckoned with was the production of crude petroleum in America; and it had become apparent that the New York and Pennsylvanian fields, from which the bulk of the oil and scale were obtained, were declining in value. For a time it was supposed that the falling off in the supply was due to a restrictive movement on the part of the well-owners, who had been working at little profit, and in some cases at a loss. But at the termination of the period of restriction, production was not greatly increased, and the output was far short of the requirements of the trade. As a necessary consequence, stocks held by the owners of pipe-lines were drawn upon heavily by refiners, in order to meet the increased demand at home and abroad. While this circumstance affected the price of crude certificates, the upward movement was slow, and periods of depression were not infrequent. This was due to a belief that sooner or later new fields would be discovered which would more than make up for the extinction of many existing sources of supply. The monthly returns of production and official statements of exports, have, however, so far given no colour to such an optimist belief. Production has no doubt been increased, mainly owing to the enormous amount of new work done during the year; but the disproportion between supply and demand has not been removed. This is generally admitted, and "bear" speculators have fallen back upon the Lima field in the State of Ohio, and to the action of the Standard Oil Company in that region. That there is plenty of oil in Ohio, and that it can be easily and cheaply obtained, is readily admitted; but whether it can be refined and sold at a profit is not so certain. Up till recently the Directors of the Standard Oil Company professed to have grave doubt on this point. They have, however, bought up large tracts of country where it is known to exist, and erected refineries for its distillation. The conclusion drawn from these proceedings is that they hold the secret of removing the obnoxious odour which adheres to it, even after the usual treatment with acid and caustic soda.

In order to show the changes which have taken place in production and consumption, we give the daily averages for the past ten years, and also the stocks held by the owners of the pipe-lines at the close of each year:—

	Average Daily Production. Barrels.	Average Daily Consumption. Barrels.	Surplus.	Deficit.	Stock in Barrels.
1880	71,107	42,949	28,158	—	13,541,682
1881	74,954	55,573	19,381	—	28,860,051
1882	82,303	60,000	22,303	—	30,419,499
1883	63,336	60,194	3,142	—	35,953,891
1884	67,684	62,076	5,608	—	37,822,470
1885	56,921	64,967	—	8,046	35,732,291
1886	70,729	73,024	—	2,295	34,350,467
1887	59,067	74,737	—	15,670	31,807,681
1888	46,707	68,871	—	22,164	23,410,062
1889	59,254	80,586	—	21,332	11,500,000

The rapid development of the trade in mineral oil for illuminating purposes has been greatly assisted by the exportation of the Caucasian deposits, which in a brief period have become as important as the wells of Pennsylvania. The magnitude of the business now done in Russian oil, taken in connection with the apparent attempts of American refiners to stamp it out, is almost incredible. Even after the discovery of petroleum in Canada and the United States, many years elapsed before serious efforts were made to tap the richer deposits in the neighbourhood of Baku. As late as 1882 the production of crude oil was only about one-sixth of the American wells, and little, if any, was exported to Europe. Since that date the trade has steadily increased, as shown by the following figures, which give the average daily output from the United States and Baku respectively:—

	United States. Barrels.	Baku. Barrels.
1882	82,303	14,850
1883	63,336	18,608
1884	67,684	27,734
1885	56,921	35,832
1886	70,729	37,000
1887	59,067	46,687
1888	46,707	56,601
1889	59,254	Not yet ascertained.

At first Russian oil was only offered in the home markets and places in the vicinity; the traffic being conducted by means of the Volga. The want of easy communication with the coast was a serious drawback. From Baku to Batoum, on the Black Sea, is about 600 miles; much of it mountainous country; and even after the oil had been transported in tank cars by the Transcaspian Railway, barrelling difficulties had to be dealt with before it could be shipped to European ports. To overcome this impediment, a new departure was taken, by the building of ships specially designed to carry oil in bulk, and the erection of storeage tanks at the principal distributing centres on the Continent and in England. In the matter of transport, Russia has proved to be quite as fertile in resource as her American rival. The action she has taken bids fair to revolutionize the carrying trade. There are now 62 tank steamers employed in the transport of oil from the United States and Batoum, exclusive of 150 on the Caspian Sea for its conveyance to the interior of Russia. At first the wooden sailing ships in which oil in barrels was carried were converted into tank vessels. But these were found to be unsuitable; and latterly iron steamers have been specially constructed for the traffic. They vary from 250 to 300 feet in length. The hold is divided into compartments,

to and from which the oil can be rapidly pumped when loading and discharging. The electric light is used, with the view to minimize the risk of fire. Explosions have occasionally taken place; but these have been due to an incautious use of lights when the tanks were empty, but charged with gas generated from the oil. At London, Hull, Newcastle, Bristol, Barrow, Cardiff, and elsewhere, accommodation has been provided for storing enormous quantities of both American and Russian petroleum. The immediate results have been to cheapen oil to the consumer, and to increase the demand far in excess of what might be looked for from the growth of population. The following table gives the imports in barrels at all ports in the United Kingdom:—

Year.	American.	Russian.	Total.
1883	1,329,004	502	1,329,506
1884	927,919	17,078	944,997
1885	1,367,720	70,149	1,437,869
1886	1,363,801	46,814	1,410,615
1887	1,444,350	188,461	1,626,511
1888	1,286,148	549,126	1,835,274
1889	1,465,265	701,924	2,167,189

Nearly all the oil sent from Russia during 1888 and 1889, and a considerable portion of that which came from America, was in tank vessels.

While the New York and Pennsylvanian fields were fairly productive during 1889, it is noteworthy that consumption was greater than during any former year. To meet the demand, it was necessary to draw upon the reserves held by the pipe-lines. At the close of 1889 these were about 11½ million barrels—a decline of 7½ million for one year, or equivalent to the production from all wells for four months. Should the present relation between supply and demand continue, pipe-line stocks will have entirely disappeared by the middle of 1891, provided always that the Lima field is not brought in to supplement the deficiency. At the end of November last the stock of Lima crude oil was 14,554,662 barrels; and, if necessary, the quantity could be largely increased.

The price of American crude petroleum during the past year was higher than since 1883; but refined oil did not participate in the advance. The official reports of exports of all petroleum products for eleven months to Nov. 30, 1889, states the quantity to have been 622,229,253 gallons, valued at $48,298,605; against 525,193,980 gallons, valued at $43,997,980, for the corresponding month of 1888. This shows an average of 7¾c. for the former period, against 8⅜c. for the latter. There has been a similar difference between the price of refined oil in London. In spite of great opposition, Russian oil is finding its way into every market, both in the east and the west, in ever-increasing quantities, and is commanding a price very little under what is paid for the best known American brands. It is also obvious that the American supply is inadequate to meet the world's wants, and that the policy of extermination carried out in the United States, by means of unlimited capital and the exercise of an undue control over some of the railroads, cannot be successfully applied against a country like Russia, which is in possession of richer deposits of the raw material. Whatever may be the ulterior motive of the Americans, the result has been to popularize the use of mineral oil as an illuminant, and in a subsidiary degree as a heating agent.

In different parts of the country, but particularly in London, great efforts have been made by two well-known Companies to dispense with the middlemen, and to bring producers and retail merchants into direct contact. Tank-carts are sent out to all parts of the city, from which the smallest dealer can be supplied at wholesale price. The well-known blue barrels with white ends are being gradually discarded; and should the present system prove successful, they will ere long only be required for remote districts. It is believed that the Companies referred to contemplate a complete revolution in the method of distribution throughout the whole country.

In addition to the present sources of supply, petroleum is found in many parts of the world. Burmah is believed to contain large deposits. There has been an oil refinery at Rangoon for many years; but the native method of obtaining the crude oil is primitive and wasteful. The proprietors have commissioned a party of American drillers to prospect for oil, and to employ the Pennsylvanian method of pumping it to the surface, if that is possible. In Canada a considerable business is done; but the oil is not so good as American, and is only used for home consumption. There is believed to be an oil belt in the Far West; but little is known either as to its extent or quality. In many parts of India, and in Borneo, Australia, New Zealand, South Africa, Venezuela, Afghanistan, Roumania, Italy, and other places, springs of oil have been met with; so that there is little chance of any appreciable falling off in the supplies for many years to come.

As far as illuminating oils are concerned, makers at home are hopelessly handicapped. The struggle at present is between America and Russia; and producers elsewhere are compelled to accept whatever may be fixed as fair value by these great contending Powers. In the whole chequered history of the oil industry prices have not been so low as during 1889; and if prosperity is to be restored, it can only be through an advance in values. In the opinion of some, consumption is already in excess of production, as shown by the absorption of stocks, which twelve months ago were known to be heavy. Whether it is expedient to anticipate an advance which may come in the natural course of things, is a question open to discussion. It is well known that the Standard Oil Company's representatives are opposed to an increase in the minimum price, and have assigned as a reason the existence of surplus stocks in America which, to the extent of 4000 tons, must be thrown this year on the market. On the other hand, the briskness of the coal and iron trades has entailed on the Scottish companies additional expenditure, which must be made up by economies at the works, by increased revenue from scale, or at the expense of the shareholders.

The Thirlmere Water Scheme.—The contract for the work to be done at and around Thirlmere Lake in building embankments, dams, and diverting nearly nine miles of roads, in connection with the water scheme of the Manchester Corporation has been let to Messrs. Grisenthwaite, of Penrith, and Messrs. Beaty Bros., of Carlisle. The amount of the contract will be £120,000, and will cover one of the most important sections of the undertaking.

METROPOLIS WATER SUPPLY.

The Quality of the Water in December.

The returns furnished to the Registrar-General by the London Water Companies on the water supply of the Metropolis during the past month show that the average daily supply was 163,651,490 gallons, being at the rate of 27·7 gallons per head of the population, as compared with 26·4 gallons in December, 1888. Of the entire bulk of water sent out, 82,662,756 gallons were drawn from the Thames, and 80,988,734 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health, was: Kent, 0·6; New River, 0·8; Colne Valley, 1·2; Tottenham, 1·5; West Middlesex, 2·4; Southwark, 2·5; Lambeth, 2·6; Grand Junction, 2·7; Chelsea and East London, 3·0. The water drawn from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was in every case of better quality than that delivered in November. All these Companies supplied efficiently filtered water. The water obtained chiefly from the River Lea by the New River Company was again of high organic purity; whilst that drawn from the same source, but lower down the stream, by the East London Company, was of the same quality as the worst of the Thames waters. Both waters were efficiently filtered. The deep-well waters of the Kent and Colne Valley Companies and of the Tottenham Local Board of Health were, as usual, of a high degree of organic purity; the Kent supply being again especially distinguished in this respect. All the waters were clear and bright."

Messrs. Crookes, Odling, and Tidy, in the course of their report to the Official Water Examiner for the Metropolis (General A. de Courcy Scott) on the quality of the daily samples of water supplied in London during December, say: "The condition of the water supply to the Metropolis during the past month has been wholly satisfactory. What little difference of character has been observable between the supply of the past month and that of the two preceding months, is in the direction of a greater degree of freedom from colour-tint and from excess of organic matter, as determined alike by estimation of the quantity of oxygen absorbed and of organic carbon present. As regards the Thames-derived supply more particularly, though falling off slightly in November, and more than retrieving itself in December, it has not presented any difference of composition that can be regarded as at all noteworthy during the past three months. Just now, indeed, it is, for the period of the year, of exceptionally high quality; the maximum proportion of organic carbon present in any one sample examined being only 0·155 part, and the mean proportion 0·143 part, in 100,000 parts of the water."

DERBY CORPORATION WATER SUPPLY.

Conversion of the Water-Works Debt.

A Special Meeting of the Derby Town Council was held last Friday week, for the purpose of considering an important scheme, having for its object the practical conversion of the interest on the water-works debt from 4 per cent. to 3 per cent.

The Finance Committee presented a report, in which they recommended the Council, in order to meet the payments falling due on April 1 next, in respect of the water-works annuities (for the redemption of which on that day twelve months notice had been given by order of the Council), to create, issue, and allot a Derby Corporation redeemable stock under the Corporation Act of 1882. In taking this step, the Committee assured the Council that the matter had received their careful attention in all its details; and they confidently recommended the adoption of the proposals. The report having been approved, Mr. Marsden at once moved the adoption of the following resolution:—"That under the authority, and subject to the provisions of the Derby Corporation Act, 1882, the Corporation acting by the Council do hereby, in exercise of their several statutory powers, create stock, to be called 'Derby Corporation Redeemable Stock,' and to be issued to an amount which shall be sufficient for the following purposes, but not exceeding £250,200:—For raising the following sums (amounting in the aggregate to the sum of £243,300, that is to say)—(1) For raising instead of re-borrowing the sum of £224,550 required by the Corporation for the purpose of paying off when due sums amounting to £224,550, which will fall due on April 1, 1890, in redemption at 25 years' purchase of water-works annuities granted by the Corporation under the Derby Improvement Act, 1879, for raising money for the purposes of the said Act, which by the said Act the Corporation are authorized to re-borrow. (2) For raising, instead of re-borrowing, the sum of £18,749 required by the Corporation for the purpose of repaying the amount temporarily borrowed by the Corporation from their bankers in order to redeem annuities granted under the Derby Improvement Act, 1870, by agreement, which annuities so redeemed amounted at 25 years' purchase to the sum of £18,749, which, by the said Act, the Corporation are authorized to re-borrow." In support of the motion, Mr. Marsden dealt at length with the financial position of the borough; with the provisions of the Act of 1879, so far as it related to the purchase of the water-works, the creation and redemption of water-works stock, and the formation of a sinking fund; and with the provisions of the Corporation Act of 1882, under which the proposal for the conversion of water-works into Corporation stock was intended to be set in operation. In referring to the Derby Improvement Act of 1879, by which the Corporation were empowered to acquire the water-works, and the price was fixed, he mentioned that the total cost was £357,512. Part of this cost was reckoned on the price of redemption at 25 years' purchase of (*a*) annuities £9520, making £238,000; and (*b*) annuities £1120, giving £28,000. The totals were £10,640 and £266,000 respectively. At the time the works were purchased, the general opinion prevailed that the Corporation had paid a very high price for them. He inclined to think that was so; but one of the merits of the conversion

scheme which he proposed that day was that the Corporation would thereby be enabled to effect a very considerable saving, or, in other words, would make a large profit inside the price which had been called exorbitant. Alderman Bemrose seconded the resolution, which was unanimously adopted. The following motion was next passed on the proposition of Mr. Marsden, seconded by Alderman Leech:—"That such stock shall be issued at the price and shall bear the dividends and be transferable in the manner hereinafter specified:—(*a*) The minimum price of issue to be £97 5s. per cent.; the first dividend to be payable on July 1, 1890, being one quarter's interest at 3 per cent. per annum, and thenceforward half yearly. (*b*) Dividends at 3 per cent. per annum, payable half yearly on the 1st day of January, and the first day of July in every year. (*c*) Stock to be issued in sums of not less than £50, and any sum in excess of £50 to be a multiple of £10. (*d*) Stock to be transferable by deed." A subsequent resolution provided for the redemption of the stock on Jan. 1, 1950, or at the option of the Corporation at par on and after Jan. 1, 1920, twelve months' previous notice in writing to the respective registered holders for the time being having been given by the Corporation. Before the Council rose, a special vote of thanks was passed to Mr. Marsden and the Finance Committee for having brought to a successful completion such a great financial undertaking.

LEAD-POISONING AND THE WATER SUPPLY OF TOWNS.

The Inquiry into the Subject at Sheffield.

That the Water Committee of the Sheffield Town Council are resolved to thoroughly investigate the question of the action of the water supply on leaden pipes, is indicated by various resolutions recently passed. At the meeting of the Committee on the 1st inst., a report on the subject was presented by the Water Engineer (Mr. E. M. Eaton); and in this he suggested that he should be authorized to pursue his investigations in conjunction with an eminent London chemist and Mr. Hawksley, the Consulting Engineer to the Committee. The first resolution passed by the Committee at their meeting on the 15th inst. gave the desired authority. By it Prof. Dewar and Messrs. Hawksley and Eaton were instructed "to inquire and report on the tendencies, causes, and remedies, of the Redmires water to take up lead, in accordance with a resolution passed at the last meeting of the Committee." The second resolution expressed the desirability, in regard to the subject of lead-poisoning from the water supply, "that the views and suggestions should be heard and considered—and, if thought desirable, further investigated, by experiment or otherwise—of Dr. Thomson, Medical Officer of Health for the borough; Dr. Sinclair White, ex-Medical Officer of Health; Mr. Allen, the Borough Analyst; and the Chairman of the Health Committee (Alderman Clegg); of any members of the medical profession in the town, or others who may have special information on the subject, or who may desire to communicate with the Committee." A Sub-Committee was also appointed to carry out this resolution; and further resolutions were agreed to, requesting the medical profession in the town to give their opinion as to the prevalence of lead-poisoning arising from the water supply, and asking the Medico-Chirurgical Society to give their views on the matter. Mr. E. M. Eaton was instructed to report to the Committee with regard to the glass-lined service-pipes which had been brought under their notice; and also as to the advisability of altering the regulations as to lead cisterns and communication-pipes.

Lead-Poisoning at Mirfield.

The occurrence of upwards of forty cases of lead-poisoning, during the past twelve months, at Mirfield, and the existence of suffering from the cause in other districts, led Mr. Alderman Kendell to bring the matter before the West Riding of Yorkshire County Council at a recent meeting, on a report of the Medical Officer of Health. In the result, it was resolved to urge upon the Local Government Board the advisability of directing an immediate and comprehensive inquiry into this subject, the result of which would, it was hoped, serve for the guidance of local authorities, and if necessary, as a basis for future legislation.

Yorkshire Medical Officers on Lead-Poisoning.

At the Annual Meeting of the Yorkshire Branch of the Society of Medical Officers of Health, at Leeds, on the 15th inst., Dr. Herbert, of Whitby, read a paper on "Lead-Poisoning;" the considerations he put forward having been suggested to him by a fatal case of lead-poisoning (the victim being a farmer's widow, about 60 years of age) a few miles from Whitby. Thinking, when he was called in, that it was a clear case of lead-poisoning, caused by potable water probably, and knowing the great danger which attached to some of the moorland water supplies, caused by their action on lead during the passage of the water through lead service or delivery pipes, which water was especially impregnated with lead if allowed to stand in the service-pipe all night, he visited the kitchen, where he found the usual filthy brass tap, coated with verdigris, fixed over the sink stone. He had a sample of this water taken, in which he found traces of lead, together with a slight but appreciable amount of organic matter; but in a second sample, taken a day or two later, no appreciable trace of lead was found. Referring to the insidious action of lead in the human system, the author pointed out that some persons were much more susceptible than others, and that those who escaped for many years often suddenly became its victims. Accumulating within the body, it gradually but surely sapped the vital powers, possibly for years, without creating suspicion. It was, he proceeded, remarkable that lead-poisoning should be rampant in most, if not all the towns supplied with moorland waters; alarming outbreaks having occurred at Sheffield, Bradford, Huddersfield, Rochdale, Keighley, Darwen, and Pudsey. Without venturing to differ from such excellent authorities as Dr. Sinclair White, Dr. Thomson, Dr. Brown, of Bacup, and others who had studied this question, he had for some time thought seriously of the danger arising from thousands of sportsmen annually sowing broadcast tons upon tons of lead upon the moors and other shooting grounds. He quoted from the Duke of Beaufort's Badminton volume, statements as to the large amount of shot discharged every season, and pointed out that oxide of lead was partially soluble in water, while in contact with organic matter—such as animal droppings, and wounded birds which were not picked up—it would form salts that were likely to impregnate the water of towns.

In the course of the discussion which followed the reading of the paper, Dr. Thomson, referring to the Sheffield water, stated that the high-level supply was capable of taking up lead to such an extent as to be extremely deleterious to health. There was no lead whatever in the water when it left the reservoir; it was only when it reached the service-pipes that it became contaminated. As to water acting on lead, Dr. Sinclair White, his predecessor as Medical Officer of Sheffield, while not absolutely committing himself, was of opinion that it was due to the presence of a certain amount of free acid in the water supply from the high level. It had also been suggested that it was due to the absence of silica. He was hardly inclined to agree with Dr. Herbert as to the moorland water supplies giving rise to lead-poisoning. In view of the uncertainty as to the final cause, he suggested that the Local Government Board should cause an inquiry to be made into the subject. Alderman Ward, alluding to Dr. Herbert's remarks as to the contamination of moorland waters, said that, though Leeds drew all its supply from the moors, he did not think there had been reported a single case of lead-poisoning arising from the water supply. The water was in the first place passed through a large reservoir, after which it was sent through iron pipes to the Wentwood filter-beds, where it underwent a process of filtration, by which means, it was contended, its susceptibility to absorb lead was removed or reduced. Dr. Cameron went into the question at some length, as it more particularly affected Huddersfield, which he believed was the first town known to suffer from lead-poisoning in regard to its water supply. The theory of the Borough Analyst (Mr. Jarmain) was that sulphuric acid in the water caused it to act upon the lead pipes. He (Dr. Cameron) was inclined to think that the organic processes taking place on the moors had a good deal to do with the production of the acid; and he believed it was the acid which produced special action upon lead. It was not, however, necessary for anyone to suffer from lead-poisoning. There were objections to iron pipes; but if they were introduced universally, lead-poisoning would not follow. Dr. Roberts was convinced that it was the acid in the water that caused it to dissolve lead. He reminded the members that the West Riding County Council had asked the Local Government Board to cause an inquiry into the subject. Ultimately, on the motion of the Chairman (Dr. Wilson), seconded by Dr. Cameron, the following resolution was passed:—"That the Yorkshire Branch of the Society of Medical Officers of Health submit to the Local Government Board that at the present time, the question of the presence of lead in the water supplies of several towns in the West Riding is exciting considerable interest. This Society considers the question of vital importance to the large populations of this district, yet one which cannot have that exhaustive inquiry which it deserves from local authorities alone. The Society would urge that this question is essentially one deserving the investigation of the Department, and that they may be pleased to order an inquiry into the whole subject."

A Lancashire Medical Officer's Views.

The Medical Officer of Health for the borough of Bacup (Dr. J. Brown) has given considerable attention to the subject of lead-poisoning. In the course of three years he had under his observation 500 cases of persons affected by "plumbism;" and the clinical and other notes taken by him he has published in a pamphlet, in which he gives some useful hints for the prevention of this disorder. He says the extremes of life are less predisposed to plumbism than those of from 15 to 50 years of age; that females are more liable than males; that most of the severe cases occur in February, March, and April; that addiction to alcohol predisposes to plumbism, prolongs recovery, and in some cases prevents complete cure; and that the majority of the worst cases occur in families who have no filter. Dr. Brown's remarks on the cause and prevention of plumbism are interesting. Soft, pure, highly oxygenated water, he says, acts readily as a solvent of lead; hard water not so freely. The solvent action of the water is assisted by pressure in the lead service-pipes and by acute angles in them, which obstruct the flow of the water. If a grain of lead per gallon is discovered in a sample of water taken from the tap in the morning, it will be found that there are 50 feet and upwards of lead piping. By this method he ascertained that several streets in Bacup had lead mains; and they were attended to. He suggests that this test should be tried elsewhere. In the Bacup water he found lead in two forms—in suspension and in solution. About 50 per cent. of the lead was removed by passing water containing 1½ grains per gallon through ordinary filtering-paper; the molecules of lead being arrested by the fine pores of the paper. From water similarly polluted all the lead was removed by passing it through a compressed carbon filter. In only one case has Dr. Brown detected lead in water after it had gone through a carbon filter; and then the filter was home-made, and of faulty construction. Of course, the best preventive of plumbism is to use as little lead pipe as possible; and where there is lead, to run off the water that has been standing in the pipes for any length of time. As substitutes for lead, cast iron is recommended, glazed earthenware, or glass-lined pipes; the latter, Dr. Brown says, being perfectly safe and not costly. Solid block tin is good, but expensive. Tinned or tin-washed lead pipes are, he says, actually more dangerous than the ordinary lead. The solvent action on lead is prevented by passing the water over a large bed of limestone, or, where the water contains a free acid, as at Bacup and Sheffield, by neutralizing it with carbonate of soda. Dr. Brown thinks that if the subject of lead-poisoning were investigated by a Commission appointed by the Local Government Board, the results would be simply astounding; and he is confident that measures would be taken to prevent recurring outbreaks of plumbism.

Electric Lighting at Brighton.—The Brighton Corporation have decided to establish electric lighting works at an estimated expense of £30,000, under their Provisional Order of 1883. The system is to be that of the continuous current at low pressure, combined with storeage batteries.

SWANSEA CORPORATION WATER SUPPLY.

Further Water Compensation Actions—The New Reservoir.

The Water and Sewers Committee of the Swansea County Council presented a long report on various matters at the last monthly meeting of that body. One of the principal things the Committee had to record was the issue of seven writs against the Corporation for damages and penalties in respect of the stoppage of compensation water during the past year. It was stated that the Town Clerk had been instructed to defend the actions. Two other claims for damages of £100 each had also been made on the same grounds; and these were under the consideration of a Sub-Committee. Concerning the new Upper Lliw reservoir, it was reported that £42,642 had been paid on account of the works in connection therewith. The general question of the water supply of the borough, the Committee mentioned, had been referred to a Sub-Committee; and the Engineer had been directed to sink a shaft at Brynwillach, and to report as to the quantity of water available from that source. The report also alluded to a deputation from the Oystermouth Local Board, which had had an interview with the Committee with a view to the Mumbles district being supplied with water. They were informed that at present the Committee considered their application premature, but that when the works now in course of progress were completed, the Corporation would be in a position to further entertain the question. Mr. J. Glasbrook, in moving the adoption of these minutes, observed that the Upper Lliw reservoir was being filled with water; and it then contained 50 million gallons. Mr. W. Lewis seconded the motion. Mr. Tutton asked that a Committee should be formed to deal with the grave questions which would arise in connection with the forthcoming water compensation actions. Mr. Usher considered it a most serious thing for the Corporation to have nine actions brought against it over the water question. Supposing they lost every case, the probability would be that they would have to pay a few thousand pounds for costs. He concurred in the suggestion that a Committee should be appointed. After some further discussion, the report was adopted.

WATER AND SEWAGE QUESTIONS AT BRADFORD.

In the course of the proceedings at the last Monthly Meeting of the Bradford Town Council, reference was made to the finances of the Water Department, and to an experiment with electricity upon sewage which the Streets and Drainage Committee are making.

In moving the confirmation of the minutes of the Water Committee, Alderman Robertshaw stated that the balance-sheet of the Department had been made out; and it showed that the money collected on revenue account during last year was larger than in 1888 to the extent of £9000. In reply to an inquiry, he further observed that the Committee had not yet completed the expenditure side of the balance-sheet; but the expenses would certainly not be much more than they were last year, except in regard to the sinking fund, which would be something like £2000 more than in 1888. The additional revenue accrued from three sources: The increase from the use of water for trade purposes alone amounted to about £4000; the income from the water used for domestic purposes had increased by rather more than £3000; and the out-townships had contributed above £1800 towards the increase. It was satisfactory that the improvement came from all directions simultaneously. There had not been a rise in the charges for water during the past eighteen months. The minutes were confirmed.

On the minutes of the Streets and Drainage Committee coming up for approval, the Chairman (Mr. R. Pratt) remarked that the Committee had agreed to ask the Council to spend £200 on an experiment in regard to the defœcation of sewage by electricity. The people who had the system in hand had found, so far as they had yet investigated it, that it could be carried out with success. The sum required was not much for so important an experiment as this; and if it were demonstrated that sewage could be treated as successfully by electricity as was alleged, the adoption of the system would be one of the greatest boons ever conferred upon any community. The minutes were approved.

The Thirlmere Water-Works of the Manchester Corporation.—At the meeting of the Manchester City Council last Wednesday, the Town Clerk stated that the Water Committee had resolved to advertise for the re-letting of the contract (No. 4) for certain works in connection with the Thirlmere water scheme that had been taken from Mr. T. W. Chester. Sir John Harwood mentioned that Mr. Chester had withdrawn certain allegations in his affidavit in support of his application for an injunction; and the dispute with him would be referred to arbitration. Mr. Chester would be responsible for the difference between his tender and the cost of completing the work. The Committee recommended the Council to approve of the letting of the contract for the embankments of the lake to Messrs. Morrison and Mason; the amount being £125,500. The proceedings of the Committee were approved.

The Cheltenham Corporation and their Water Engineer.—The Special Water Committee of the Cheltenham Corporation, to whom was referred the letter addressed to the Town Council by Mr. M'Landsborough, their Water Engineer, on the 31st ult., enclosing notice of his intention to terminate his engagement on the 1st prox. (see *ante*, p. 74), considered the matter at a meeting on the 15th inst., with the result that the following resolution was come to:—"That inasmuch as no reflections have been made by the Town Council on Mr. M'Landsborough's personal or professional character, and as his engagement will terminate, in pursuance of his notice, accepted by the Council, on the 1st prox., the Committee see no object to be gained by instituting any further inquiry." Mr. M'Landsborough attended the meeting, with reference to his offer, after the termination of his engagement with the Corporation, to continue the management, for the present, at the same proportionate rate of salary, subject to his being able to accept such private practice as might offer itself; and the Committee resolved that the offer be accepted. At the Council meeting on Monday last week, the Committee's proceedings were confirmed.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

The election of County Councils under the new Scotch Local Government Act are at present absorbing public attention here. Rural communities have almost nothing to do with gas supply; but it is otherwise with that of water. Some of the most ticklish questions in connection with water supply arise in villages, where the rental is small, and assessments consequently become ruinously high. It is not unlikely that the new County Councils will have some trouble in these matters.

In Aberdeen a singular complaint by a gas consumer has been dealt with by the Gas Committee of the Town Council. The complaint was that the charge for gas had risen from £1 12s. 2d. in one six months to £6 8s. 5d. in another; the increase being due to a leak, the existence of which was not discovered because the smell of the escaping gas went up the chimney of the house. It was maintained in a sort of *quasi*-legal way, that the Council could not sue for the amount claimed because periodic inspections of the gas-meter were not made. The Committee were satisfied that periodic inspections were made; and they dismissed the complaint. Had they done otherwise, they would have recognized the principle that escaping gas is to be detected by the sense of smell only, which is a contention not tenable in law. The instrument which shows how much gas is being consumed is alone recognizable as the agency by which irregularities are to be brought into notice; and bringing them into notice is tantamount to putting a stop to them.

An action was recently brought in the Edinburgh Sheriff Court, by the Mid and East Calder Gaslight Company against the Oakbank Oil Company, Limited, to have the defenders ordained to lift, repair, and re-lay the gas-pipes leading from the public road at East Calder to Calderhall House; and, failing their doing so, to grant authority to the pursuers to do the work to the satisfaction of a party to be appointed by the Court. The pursuers averred that these pipes had been injured by mineral workings; that they were moved by the defenders in 1887, without authority; that they had not been in a satisfactory state since then; and that a large leakage of gas had taken place. In reply, the defenders admitted that they shifted the pipes, but said that they repaired them, and that no injury by mineral workings had since taken place. Sheriff Rutherfurd has issued a judgment, finding that between the beginning of February, 1887, and the present time, there has been great leakage of gas from the pipes, caused either by subsidence of the ground owing to the mining operations of the defenders and the original Oil Company, or to the defective manner in which the defenders replaced that portion of the pipes which they uplifted. His Lordship finds in law that the defenders are bound to take such steps as may be necessary for the purpose of preventing, as far as possible, further loss of gas by leakage. He therefore ordains the defenders to execute alterations and repairs on the line of pipes in question.

The electric light proposals for Dundee, which have been in a nebulous state for some time, have this week settled down into definite shape, the result, doubtless, of the want of support which the promoters of the Corporation scheme have received from the public, as stated in my last week's "Notes." Hitherto the three bodies—the Town Council, the Police Commission, and the Gas Commission—have been joint promoters of the scheme; the understanding being that Parliament would decide which of them should have the permanent control of the electric supply. The expectation was that a profitable business was to be carried on; and it looked as if there was a competition for the honour of managing it. The replies to the circulars of the Joint Committee have, however, dashed any hopes which might have been entertained in that direction; and it being necessary that public powers should be taken, in order to keep out the Scottish House-to-House Electric Supply Company, who are seeking powers, the question came to be on whom should be laid the "burden" of introducing the light. Meetings were held on Wednesday, at which it was decided that this task should devolve upon the Gas Commission, probably as being already the lighting body. The Bill of which, along with a Provisional Order, notice was given, will now be dropped, and only the Provisional Order will be prosecuted. The whole costs are to be borne by the Gas Commission. The Trades Council of Dundee met on Wednesday night, and adopted a resolution advising delay in going in for any scheme of electric lighting.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

Mr. Alexander Murdoch, of this city, who is, I believe, grand-nephew of William Murdoch, the inventor of gas lighting, is said to be at present engaged in the preparation of what ought to be the most complete account of that "man of light and leading" which has yet been given to the world. There is one period in William Murdoch's life on which he would be glad to have some additional light thrown—in connection, that is to say, with the visits which he was known to have made to Old Cumnock (near his birth-place of Auchinleck) and other parts of Ayrshire about the time referred to. He had lighted what had been described as "his premises at Old Cumnock" in 1797 with coal gas, similar to what he had done to his house and offices at Redruth five years before. The biographer believes that it is scarcely possible that a man so eminent as the inventor of gas lighting can have been entirely overlooked in the newspapers of his native county. He is consequently encouraged to hope that he may yet be put in possession of interesting information bearing on the life and work of his distinguished relative at that time. He makes a special appeal on the subject to the editor and readers of a county newspaper which has been in existence for upwards of ninety years.

There are evidences abroad that the prospective parliamentary fight over the Bill that is being promoted by the Partick, Hillhead, and Maryhill Gas Company is already causing some persons to buckle on their armour. In response to a requisition from eleven of the ratepayers of the suburban burgh of Hillhead, the Provost has convened a public meeting of the ratepayers for the purpose of considering the Bill in question, and of resolving what steps, if any, should be taken relative thereto. It is thought that the ratepayers of the other two burghs—Partick and Maryhill—will "go and do likewise."

The Special Committee of the Glasgow Corporation on Electric

Lighting have now formally lodged objections with the Board of Trade against all the Provisional Orders that have been asked for in connection with the electric lighting of Glasgow and suburbs, with the exception of that of the Brush Company, the withdrawal of which I have already mentioned.

I am told that some of the gas consumers who have hitherto been getting their gas supply from the Partick, Hillhead, and Maryhill Gas Company are desirous of dealing henceforth with the Glasgow Corporation Gas Commissioners. There is, however, a serious difficulty interposed to prevent this desire being fulfilled. Hitherto the Company's gas has in many instances been taken by the consumers partly on account of the fact that the service-pipes have been laid by the Company without any cost to the customers. The Glasgow Corporation, on the other hand, are forbidden by law to do anything of the kind; and consequently no change may in the meantime be made as to getting gas from the Corporation instead of the Company. Another question now comes in for consideration—viz., "Are the Company paying poor-rates and other taxes on these service-pipes?" I know that this matter has been exciting some attention in the minds of persons connected with the Glasgow gas supply undertaking; and I doubt not but that the inquiry will be pushed home before the actual fight begins in the Parliamentary Committee-rooms. Every legitimate effort will be made by the Corporation to outwit the Company so as to prevent their Bill being passed into law.

I have heard it stated that negotiations are in progress between London and Edinburgh which have for their object some action on the part of the Lord Advocate in the way of legislation to make it clear how municipal authorities in Scotland are to act in electric lighting matters, in such cases as Glasgow, where the Town Council, Police Commissioners, and Gas Commissioners are one and the same body of persons. Edinburgh and Leith, Dundee, Perth, Aberdeen, Paisley, and Greenock are in a somewhat similar position of doubt as to which body is really the Local Authority under the Electric Lighting Acts. Town Clerks do not all agree with each other on the rather knotty point, and some of them are disposed to disagree with the Lord Advocate in the opinion which he, as a lawyer—not a law officer—has expressed in reference to the matter. It is a serious reflection on the legislative wisdom and forethought of the law officers that they did not, when the Bill was before Parliament in 1888, provide for a clear definition or interpretation of the term "Local Authority" in connection with the supply and sale of electric power.

At last Monday's meeting of the Town Council of Glasgow, sitting as the Police Board, Mr. Chisholm submitted the following motion:—"That the Parliamentary Bills Committee be instructed to prepare and promote in Parliament on the very earliest opportunity amendments on clauses 359, 361, and 362 of the Glasgow Police Act, 1866, as follows:—(1) On clause 359, which provides for the lighting of private streets and courts, instead of the words, 'the proprietors shall pay such sums as the Board may fix, not exceeding 15s. per annum,' insert, 'the proprietor shall pay such sum as the Board may fix, as necessary to cover the cost thereof.' (2) On clause 361, which provides for the lighting of common stairs, instead of the words, 'the proprietor or proprietors shall pay to the Board such sum, not exceeding 10s. per annum, as the Board may direct,' insert, 'the proprietor or proprietors shall pay such sum needful to cover the cost thereof as the Board may direct;' and further, before the words, 'the said sum shall be recoverable by the proprietor from the occupiers,' insert the words 'one-half of.' (3) On clause 362, delete the words, 'each proprietor shall be entitled to a deduction from the Board of 20 per cent. on the sum payable by him;' or in some other way, as to the Parliamentary Bills Committee may seem best, secure to the Board powers to carry out the alterations referred to." In support of his motion, he said that his object was to relieve the rates of a burden which, he considered, pressed upon them unjustifiably. The average annual loss to the ratepayers for the last seven years in connection with the lighting of private streets and courts had been £2062; and the average annual loss in connection with the lighting of common stairs over the entire period during which the present system had been in operation had been £8116—the two sums together meaning a loss annually of above £10,000, or 1d. per £1 on the rates. The motion having been seconded, an amendment in the shape of "the previous question," was moved and seconded. For the latter there were 15 votes against 13 for the motion.

Glasgow Corporation 6¾ per cent. gas annuities have been dealt in this week on the Glasgow Stock Exchange at £210; and the shares of the Partick, Hillhead, and Maryhill Gas Company have changed hands at £5 5s. per share.

There has been a depressed market for sulphate of ammonia this week. Sales have taken place at £11 15s. per ton; and one maker is reported to have accepted £11 13s. 9d., usual terms. Although these prices seem cheap, when compared with last year's quotations, buyers meantime hold off in expectation of still lower figures. Prices at this time last year were £12 7s. 6d. to £12 10s. per ton.

The Glasgow pig-iron market has been very quiet this week and without any fluctuation of importance to mention in respect of the quotations for Scotch warrants. At the same time there is a distinct lull in the demand, in consequence of which speculators are shy to buy; while those who are holders seem to be apprehensive of the early future. There are 88 blast-furnaces in actual operation, as compared with 79 at this time last year; and yet the decrease of the stocks in the public warrant stores is going on at the rate of 5000 or 6000 tons or more per week. Hematite iron is being made in thirty furnaces, basic iron in five, and ordinary Scotch iron in fifty.

In many cases there is considerable difficulty in getting full supplies of coal; and the result is that for prompt delivery higher prices are obtainable. Coalmasters are not acting in unison on the wages question; and hence miners are encouraged to hold out for an increase of pay.

The Electrical Engineering Corporation, Limited, is the title of a Company registered last week with a capital of £150,000, in £5 shares, to carry into effect certain agreements for the transfer to the Company of the respective businesses of the United Electrical Engineering Company, Limited, and Messrs. J. G. Slatter and Co., Limited.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 25.

Sulphate of Ammonia.—The "bear" speculators being the only purchasers, the market remains very dull; and if prices are not sensibly lower, it is due to the cautious reserve adopted by many makers in the disposal of their production, while those producers who throw their parcels on the market independently of the actual position, are responsible for the lowering of prices. The principal business during the week has been done at £11 17s. 6d. at the various ports; and there is no change in the position generally beyond the fact that the "bears" are quoting and selling for February-March delivery at 2s. 6d. to 5s. below to-day's values, which lends colour to the assumption that the tactics of these operators will be continued for some time to come. The reports in the JOURNAL have been several times commented upon in certain quarters; but any stigma which is intended to be attached to them, must fall flat, seeing the motives which underlie these attacks. Behind the bulwark "of a sense of responsibility," it is attempted to persuade producers to accept lower prices; but as long as "the wish is father to the thought" it serves no purpose here to go beyond the real facts of the position. The latter is in no way changed; but it may again be pointed out that the "bears" by still absorbing the orders (principally for February-March delivery), are creating an artificial dulness, which they represent as being due to the absence of demand. It is easy enough to take credit for having predicted a fall, when operations tend towards this end. As regards the Paris quotations, which are carefully reported as again reduced, it may be explained that these low quotations are made only with the strict stipulation *that the sulphate be exported!* French producers adopt the American style of giving foreigners the advantage of cheap material, in order to keep up the price to home consumers. The production of sulphate is now getting less heavy; and makers need not push their sales too much, for nitrate prices may presently take a quite unexpected turn.

LONDON, *Jan.* 25.

Tar Products.—Benzoles continue to be in good request, as also does toluol and solvent naphtha. Creosote is somewhat weaker; and carbolic acid is not easy of sale. Anthracene is very firm; and higher prices are being asked in all positions. Pitch is decidedly flat; and it is not unlikely that lower prices may be seen, especially if the strikes in Belgium and Germany continue. Prices: Tar, 25s. to 30s. per ton, according to position. Benzol, 90 per cent., 3s. 11d. per gallon; 50 per cent., 3s. per gallon. Toluol, 2s. per gallon. Solvent naphtha, 2s. per gallon. Pitch, 30s. to 35s. per ton, according to position. Crude naphtha, 1s. 4d. per gallon. Light oil, 4½d. per gallon. Lucigen creosote, 3d. per gallon. Ordinary creosote, 2½d. per gallon. Carbolic acid, 3s. per gallon. Anthracene, nominal (30 per cent.), "A" quality, 1s. 6d. per unit; "B" quality, 1s. 3d.

Ammonia Products.—Sulphate is entirely in the hands of "bears;" and it remains to be seen how far makers will succumb to the influence now being brought to bear upon them. Sales have been reported as low as £11 15s.; and the price for the week may be taken as ranging from £11 15s. to £11 18s. 9d. Other ammonia products are firm, and in good request.

The Lindfield Gas Company's Works.—The small Gas Company carrying on operations at Lindfield have had a struggling existence; and the proprietors have now determined to offer their works to the more prosperous Company at Haywards Heath for the sum of only £251! It seems that there are only 251 shares; and so long as a clear sovereign per share is realized, the shareholders will be content. For some time past, on public grounds, the amalgamation of the smaller Company with the larger one has been advocated; but whether the latter will consider £251 a fair price to pay for the Lindfield Company's property remains to be seen.

Threatening the Halifax Gas-Works Superintendent.—At the Halifax Borough Police Court last Friday week, Patrick O'Dowd, who was formerly employed at the Halifax Corporation Gas-Works as a stoker, was brought up in custody under a peace warrant, taken out at the instance of Mr. J. Hoggard, the Superintendent of the works. The complainant stated that on the night of Nov. 30 last, the prisoner came to him inside the gas-works and used some very foul language; at the same time saying he would murder him before the winter was out. Prisoner admitted that he had threatened the complainant; but said he was provoked through being dismissed from his work through him. The Magistrates decided to bind him over for six months, himself in £50, and two sureties in £25 each.

Failure of an Electrician.—At the London Bankruptcy Court last Wednesday, the first meeting of creditors of James Fyfe, described in the petition as a stockbroker, of St. Stephen's Chambers, Telegraph Street, was held. The failure took place in December last; and the debtor had filed no accounts. He stated that he was not a stockbroker, but carried on business as an electrician, and had only the use of a room in St. Stephen's Chambers. Up to the year 1884 he was Managing-Director to the Pilsen-Joel and General Electric Light Company, Limited; and in 1887 was part promoter of the Ross Oil Lighting Company, Limited, which has since gone into liquidation. The debtor alleged that he had not been paid for his services. He had a joint venture with Mr. Arthur J. Howes, of St. Stephen's Chambers (whose offices he uses), for the introduction of a new electric arc light. The debtor made a private arrangement with his creditors in Scotland in 1869, when he paid a composition of 7s. 6d. in the pound; his liabilities, secured and unsecured, amounting at that time to £6000. His present total debts (secured and unsecured) are about £17,000. He was a promoter in England of a scheme for lighting by electricity the town of Las Palmas, in the Canary Islands, the concession for which has not yet been granted. In reply to a question, the debtor stated that in all probability about £14,000 of his liabilities would not rank against the estate. It was not in the interest of his creditors to make him a bankrupt, as if he was left free to act, he would ultimately be able to pay his creditors in full. Eventually the matter was left in the hands of the Official Receiver.

The Saltley (Birmingham) Gas-Works Accident.—The Royal Humane Society last Wednesday awarded a silver medal to Richard Smith for his efforts in saving Joseph Beswick and trying to save Thomas Case at the Saltley Gas-Works on Dec. 11, under circumstances recorded in the following issue of the JOURNAL. An "In Memoriam" certificate was awarded to the family of James Chew, who was killed while assisting Smith. The case was brought under the notice of the Society by the Mayor of Birmingham.

The Huntingdon and Godmanchester Gas Company's Provisional Order.—The Huntingdon Town Council have determined to oppose the application to the Board of Trade of the Huntingdon and Godmanchester Gas Company for a Provisional Order giving them additional powers; and their action has been endorsed by a public meeting of ratepayers and gas consumers. The Godmanchester Urban Sanitary Authority have recommended the Corporation to transmit to the Board of Trade certain objections to various clauses in the Order.

A "Ridiculous" Suggestion.—Last year the Corporation of Margate obtained an Act of Parliament, by which, among other things, the coal dues in the borough were reduced 3d. per ton; and by this the Gas Company benefited to the extent of £150 a year. At the meeting of the Town Council last Tuesday, Mr. Laird proposed that they "do request" the Company "to agree to allow" this sum to be applied towards paying for the gas consumed in 30 or more new lamps to be placed where wanted in the borough. The resolution, which was truly characterized as a "childish" and "ridiculous" one, was negatived. At the same meeting, the Electric Lighting Committee were instructed to inquire into the best mode of lighting the borough by electricity.

Master Plumbers and the Newport Corporation Water Department.—At the annual meeting of the Newport Operative Plumbers' Society last Wednesday a resolution was passed respectfully requesting the Newport Town Council to draw up rules and regulations for the better management of the Water Department, and also protesting against the Corporation undertaking plumbing work, as thereby they became competitors with the master plumbers of the town, who, as ratepayers, provided the Corporation with capital to compete against them. It was stated that a deputation had waited on the Water Committee earlier the same day, and that masters and men had been peremptorily dismissed by the Chairman (Colonel Lyne) without a single question being satisfactorily answered.

Fatal Explosion of Natural Gas.—According to a Reuter's telegram despatched from New York last Saturday, a catastrophe, causing serious loss of life and creating great alarm, occurred at Columbus, Ohio, on the previous day. Owing to a leakage in the main, a quantity of natural gas exploded in a house. The streets were at the time crowded with people engaged in shopping, and with workmen returning to their homes; and a large crowd soon gathered upon the scene. Suddenly a second explosion occurred in a brick edifice close by; a mass of *débris* and dust filling the air. The people fled terror-stricken, but not before six had been killed and a large number more or less seriously injured. The explosion appears to have been caused by an accumulation of gas in the cellar of the first house, where there was no gas-pipe; but there was a leakage in the main in the locality, and the flame passed from the cellar of the first house to the other. Both the houses were shattered, but the roadway was not damaged. A Central News telegram adds that a fire afterwards broke out among the ruins; and the fire-engines added to the list of fatalities by dashing at full speed through the crowd.

The Northern Coal Trade.—The large demand for coal in the north continues, though it is not quite so strong as it was a fortnight ago; the collapse of the demand for Belgium having affected it. There is also a falling off in the inquiry for coal for the local gas companies; the lengthening days decreasing the consumption of gas. Steam coal is still in full demand, at from 13s. 6d. to 14s.; but it is now expected that there will be a few weeks' dull trade, as is usual at this season of the year. Gas coal is firm; the exports being large, especially to Genoa and to Portugal. This maintains the price at about 15s. per ton, free on board in the Tyne, for best gas coals. Though the falling off in the consumption must be expected to continue for five months, yet it will not be so fully felt as in some previous years, as many of the factories will work overtime for some months, and the large traffic of the railway companies will force work, and consume gas through the nights. There is little change in the condition of the manufacturing coal trade; the demand being very large, and the output scarcely sufficient. The price is firmly maintained. Coal for the use of steamships is also steady; but the household coal trade is dull. Coke sells freely, and at high prices, both for gas coke and for ordinary qualities; the price of the former being about 13s. per ton, and that of the latter 30s. per ton.

Annual Supper of the Employees of the Ilkeston Corporation.—Last Friday the annual supper was given to the men employed by the Ilkeston Corporation. Originating with the Gas Department, these entertainments have for the past two years been extended to the Health, Sewage, and Water Departments. Under the presidency of the Town Clerk (Mr. W. Lissett), as many of the men as could be spared from duty were present. After supper, the Town Clerk addressed a few words of excellent advice to the men, and then called upon Mr. F. C. Humphrys, the Gas Manager, to propose the health of the Mayor and Corporation. In doing so, Mr. Humphrys took occasion to compliment the men on the evening's proceedings, and added that, having a few pounds to spare, they proposed not to forget the wives and children, and each man would be presented with a packet of grocery or some useful article before he went home that night. The Borough Surveyor (Mr. Kilford), replying on behalf of the subscribers to the supper, read a list of subscriptions obtained by himself and the Gas Manager, including many from outside sources. The healths of the Gas Manager and the Surveyor were afterwards drunk, with musical honours; and for the rest of the evening attention was concentrated on the stage erected at one end of the room, where an excellent variety entertainment was gone through. The Mayor and Mayoress, many of the councillors, Mrs. Humphrys and Mrs. Kilford, and many other prominent ladies and gentlemen, watched the proceedings, which terminated about midnight with the singing of the National Anthem.

Electric Lighting in Lancashire.—At a special meeting of the Bolton Town Council last Saturday, the Gas Committee recommended that the application of the House-to-House Electricity Supply Company, Limited, for powers to lay down plant and carry on business in Bolton, should be opposed. A resolution to this effect was passed; and the following resolution was also adopted:—"That it is highly important to the public interest of the borough that no power for the supply of electricity, in relation to Bolton, should be conferred upon any body or person other than the Corporation; and that the Council should make application for such powers as soon as a reasonable and sufficient demand for the same arises." A similar course was taken by the Bury Town Council at a special meeting held last Thursday.

The Gas Supply of Allerton, near Bradford.—Since the township of Allerton was added to the Borough of Bradford, the residents in the district have had a grievance arising out of the circumstances under which they are supplied with gas. The township is within the area covered by the Clayton, Allerton, and Thornton Gas Company, whose charge for gas is at a higher rate than that of the Corporation Gas Department. The residents have, therefore, agitated for some alteration, which shall place them in a similar position to that of the ratepayers in other parts of the borough; and it has been suggested that this might be done either by the Corporation purchasing the gas in bulk from the Company and supplying it to consumers at Allerton at the same price as other parts of the borough obtain gas from the Corporation, or that there should be such a differentiation of the rates of the township as would compensate for the extra amount paid for gas. This question was under consideration by the Gas Committee of the Corporation last Friday, when a deputation, representing the ratepayers of Allerton, attended for the purpose of advancing their claim. Several Directors of the Gas Company subsequently had an interview with the Committee, and intimated the terms on which they would be willing to sell their works and rights. These were considered too high by the Committee, who stated that they would not be justified in giving a price higher than the value of the Company's shares in the market. The representatives of the Company said that an offer on such a basis could not be accepted; and the interview terminated with the expression of a hope by the Committee that the Directors might see cause to reconsider the matter.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

For Stock Market Intelligence, see ante, p. 144.

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	17—18	..	5 16 8
100,000	10	,,	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	108—110	..	4 10 11
100,000	20	28 Nov.	8	Bahia, Limited	20	19½—20½	..	7 16 1
200,000	5	14 Nov.	7½	Bombay, Limited	5	6¾—6⅞	..	5 11 1
40,000	5	,,	7½	Do. New	4	4¾—5¼	..	5 17 10
380,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	218—223	..	5 9 10
125,000	,,	,,	9½	Do. New	100	158—163	..	5 13 6
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	41—43	..	5 2 4
320,000	20	27 Sept.	11½	British.	20	43—45	..	5 0 0
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21	..	5 4 9
39,000	10	,,	8	Do. 7 p. c.	10	13—15	..	5 6 8
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	13—14	..	7 2 10
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13⅜	Commercial, Old Stock	100	244—249	..	5 10 5
130,000	,,	,,	10½	Do. New do.	100	195—200	..	5 7 6
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	+1	3 13 2
557,320	20	12 Dec.	13	Continental Union, Limited	20	47—48	..	5 8 4
242,680	20	,,	13	Do. New '69 & '72	14	32—34	..	5 6 7
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	26 July	13	European, Limited	10	23—25	..	5 4 0
120,000	10	,,	13	Do. New	7½	17—18	..	5 8 4
354,060	10	,,	13	Do. do.	5	11—12	..	5 8 4
5,470,040	Stck.	14 Aug.	13⅜	Gaslight & Coke, A, Ordinary	100	246—251	−2	5 9 6
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	255—260	+3	3 16 11
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	160—165	..	4 4 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	250—255	+2	3 18 5
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	113—116	+1	3 9 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	121—125	..	3 12 4
650,000	,,	,,	6	Do. 6 p. c. do.	100	160—170	..	3 10 7
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	213—218	..	5 10 1
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5¼	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	113—115	..	4 6 11
541,920	20	28 Nov.	6	Monte Video, Limited	20	18¾—19⅜	..	6 3 1
150,000	5	28 Nov.	10	Oriental, Limited	5	8⅝—9	..	5 11 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5⅝—6⅛	..	5 12 9
166,870	10	26 July	4	Pará Limited	10	3¾—4¼	..	5 17 9
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	100—105	..	5 14 5
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	16 Oct.	10	San Paulo, Limited	10	14½—15½	..	6 9 2
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	295—305	..	5 6 6
1,350,000	,,	,,	12½	Do. B do.	100	228—233	..	5 4 1
141,500	,,	,,	13½	Do. C do.	100	240—250	..	5 6 0
600,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137—142	+2	3 10 5
60,000	5	12 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	1 8 5
				WATER COMPANIES.				
728,446	Stck.	30 Dec.	9½	Chelsea, Ordinary	100	260—265	..	3 11 8
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	211—215	..	3 9 9
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	143—146	..	3 0 10
700,000	50	12 Dec.	9	Grand Junction	50	125—130	..	3 9 3
708,000	Stck.	29 Aug.	10½	Kent	100	270—281	..	3 14 9
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	252—256	..	3 14 2
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	124—128	..	3 2 6
500,000	100	14 Aug.	12½	New River, New Shares	100	365—370	+1	3 5 6
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	128—131	..	3 1 0
902,300	Stck.	12 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	165—170	..	3 10 7
126,500	100	,,	6	Do. 7½ p. c. do.	100	163—168	..	3 11 3
1,155,066	Stck.	12 Dec.	10	West Middlesex	100	260—265	..	3 15 6

The Dangers of Oil-Lamps.—We understand that a resident at Belvedere (Kent) has made a claim against the Erith Local Board for £10 damages, on account of his wife becoming ill from shock consequent upon the bursting of an oil-lamp belonging to the lighting contractors for the district.

Public Illumination in Newcastle.—On Jan. 26, 1818 [says the *Newcastle Chronicle*], Mosley Street, Newcastle, was first lighted with gas; and it was the first street that was so lighted in the town. The first gas-works were erected in Forth Street; the second, in the Manors; the third, near the Swirle, North Shore; and these in more recent times have been succeeded by the extensive works at Elswick and at Redheugh. "Within the past few days," adds our contemporary, "we have had the public introduction of the electric light by two Companies; and as the Newcastle and Gateshead Gas Company's Directors have just recommended a dividend of 9¼ per cent., it seems evident that there is a profitable field for both kinds of illuminating agencies."

Southampton Corporation Water Supply.—At the meeting of the Southampton Town Council last Wednesday, Mr. Nichols moved the rescinding of the resolution passed by the Council on May 22, to cover over one of the reservoirs on the Common. The cost was to have been £2500, which really meant £5000, because one could not be covered up with safety without the other, as the arch would be too heavy to support. The Local Government Board required alterations to the extent of a further £6000; and such an outlay could not in any way be justified. Mr. Payne seconded the motion, which, in the subsequent discussion, met with some opposition; and it was eventually withdrawn, on the understanding that no money would be spent on the reservoirs for twelve months.

Ystrad Gas and Water Company's Bill.—A public meeting of ratepayers was held last Thursday at Ystrad, to consider the Bill which has been promoted by the local Gas and Water Company for the purpose of giving them further powers. The various provisions in the Bill were explained. It was considered that the clause referring to certain alterations in the charges of the Company should be strenuously opposed, and also that alluding to the position of the proposed new reservoir, No. 4, which it was held would be dangerous to life and destructive to property. It was unanimously resolved to send a deputation to wait on the Local Board, urging them to oppose the passing of the Bill, and to suggest the advisability of the acquisition of the gas and water works as the best course for the interests of the ratepayers. At Ystrad Rhondda, at a public meeting on Wednesday, it was also considered that the best possible course to take was to try and induce the Board to purchase both gas and water works, and, failing this, to strongly oppose the Company's Bill.

Bristol and the Electric Light.—The Electrical Committee of the Bristol Town Council held a meeting last Thursday, when the question of introducing the electric light into the city was discussed. At the previous meeting it was agreed to ask Mr. W. H. Preece, who is advising the Council, to supply plans and estimates for lighting five of the principal thoroughfares; and it was reported last Thursday that, in accordance with this request, a carefully prepared estimate had been received from Mr. Preece. In order that the Committee might have an opportunity of studying details, it was agreed that the document should be printed for distribution among the members, and that another meeting should be called for an early date to take it into consideration. Meanwhile, the Committee will advise the Council to oppose the granting of Provisional Orders to the House-to-House Supply Company and the Brush Electrical Engineering Company, who have given notice of their intention to apply for powers to supply Bristol; this course being resolved upon in view of the Corporation undertaking the work themselves, or, at all events, exercising a control over it.

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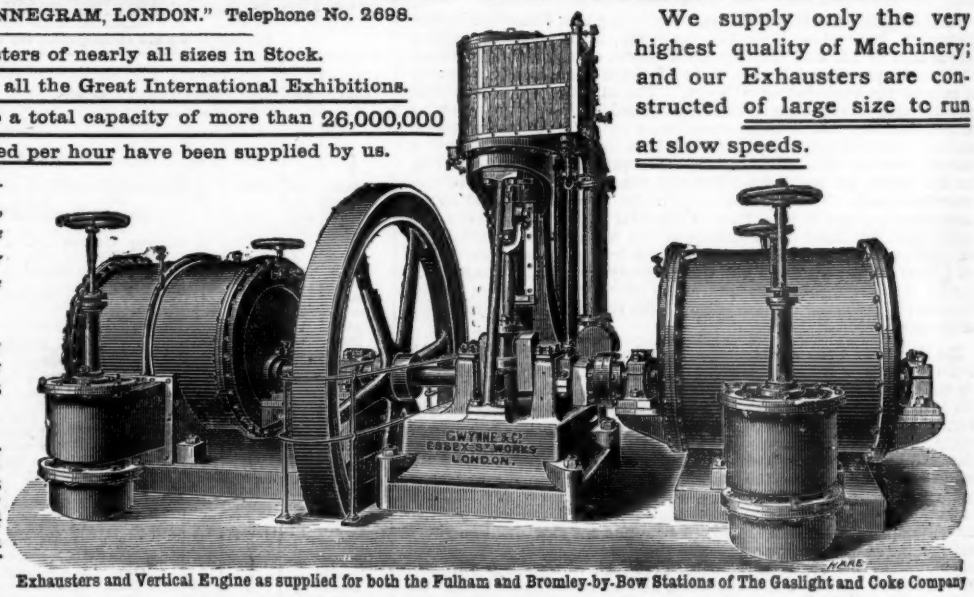

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COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 129.
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BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
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AGENTS wanted for Gardner's New PATENT REGENERATIVE GLOBE COVER. Increases the Illuminating Power of Gas 120·5 per cent., as tested by the Glasgow Corporation Gas Department. Suits Globes at present in use. Retail Prices from 1s. to 1s. 9d. each, according to size. One trial gives convincing proof.
Send business card, with references, to the Patentees, A. GARDNER AND SON, 55, Jamaica Street, GLASGOW.

A YOUNG Man, age 21, desires a Situation as GAS-FITTER and STOVE and METER FIXER. Has had a good insight into Smith Work in general.

Address W. R., 8, St. George's Place, Lower Mortlake Road, Richmond, SURREY.

METER and General Inspector requires RE-ENGAGEMENT. Thorough practical knowledge of Gas-Fitting and Stoves, Meter Testing, and general Distribution. Could also undertake Collecting. Fourteen years in present situation. Unquestionable references.

Address No. 1776, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a practical (married) Man, age 29, the MANAGEMENT of a medium-sized Gas-Works. Has held present Management four years. Is used to Engines and Exhausters; also the Superintendence of Men both in and out of Works. A life abstainer.

Address No. 1775, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN, engaged upon Drawings for Extensions and Plans of Works, will shortly be in want of similar EMPLOYMENT under Engineer or otherwise. Capable of taking sole charge of Designing and Superintending the Erection of Gas-Works. First-class testimonials.

Address 1781, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ASSISTANT Manager wanted immediately by a Brazilian Gas Company. Must have a practical knowledge of the Manufacture and Distribution of Coal Gas, and be able to superintend the office if required.

Address, stating previous occupation, age, and salary required, G. W., 416, Messrs. Deacon's, 154, Leadenhall Street, LONDON, E.C.

JUNIOR Draughtsman wanted. Must be able to draw fairly well and trace rapidly, and accustomed to Gas Engineering Construction Work.

Address, giving full particulars, age, and salary expected, J. D. R., 157, Deacon's Advertising Offices, Leadenhall Street, LONDON, E.C.

WANTED, a Stoker for a Country Gas-Works. Must be used to Shovel Charging. Constant place for a steady man.

Apply, with testimonials, to the MANAGER, Gas-Works, Romsey, HANTS.

RETORT SETTER WANTED.

WANTED, an experienced Retort SETTER and BRICKLAYER. Permanent situation for a steady Man.

Apply, by letter, to No. 1780, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two thoroughly experienced reliable Men as FOREMEN STOKERS to attend Boiler and Exhauster, read Station Meter, &c. Permanent employment to suitable Men. Wages, 28s. per week.

Apply, sending references on or before Saturday, the 1st of February, 1890, to NEILL MEIKLEJOHN, Manager and Secretary, Gas-Works, Longwood, near HUDDERSFIELD.

COLNE AND MARSDEN LOCAL BOARD.

WANTED, an Engineer and Manager to take charge of the Gas-Works. The person appointed must have a thorough, practical knowledge of the Manufacture and Distribution of Gas, the Laying of Main and Service Pipes, and be competent to prepare Plans, &c., and carry out new Works.

The make of Gas is about 60 million feet per annum.

Applications, stating age, &c., and salary required, with not more than three testimonials of recent date, to be forwarded to the undersigned, endorsed "Gas Manager," not later than the 10th of February, 1890.

ALFRED VARLEY,
Clerk to the Board.

Local Board Offices, Colne, Jan. 14, 1890.

RETORT Setter wanted. Five or Six weeks' work near London.

Apply, stating experience and wages required, to ASHMORE, BENSON, PEASE, AND CO., LIMITED, STOCKTON-ON-TEES.

GAS MANAGER WANTED.

THE Festiniog Local Board require a MANAGER for their Gas-Works. House, Light, and Coal free.

Applications, stating salary required, and enclosing three recent testimonials, to be sent to me on or before the 5th day of February next.

(Signed) G. H. ELLIS (Solicitor),
Clerk.

WANTED, a Livesey Washer to pass 500,000 cubic feet of Gas per day, and a 20-feet square PURIFIER, new or second-hand.

Apply to Mr. J. R. FAITH, Gas-Works, RUNCORN.

FOR SALE—One 8-horse power Engine and COAL BREAKER, with top and bottom Elevator, Gear, and Patent Wrought-Iron Chain, with Malleable Iron Buckets complete.

The above Machinery is almost new, having only been in use about Three months.

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PURIFIERS FOR SALE.

THE Glasgow Corporation Gas Commissioners are prepared to receive TENDERS for the following sets of PURIFIERS, recently thrown out of action in consequence of extensions at their Tradeston Gas-Works:—

4	Purifiers each 20 feet by 15 feet by 5 feet.
4	do. 18 feet by 18 feet by 6 feet.
4	do. 18 feet by 18 feet by 6 feet.
4	do. 26 feet by 18 feet by 5 ft. 8 in.

Purchasers to take down and remove the Purifiers at their own expense.

Offers will be received for either the whole or one or more sets.

Form of tender and full information may be obtained on application to Mr. Foulis, the Gas Engineer, 45, John Street, Glasgow.

Sealed offers, endorsed "Tender for Purifiers at Tradeston," and addressed to the subscriber, will be received on or before Tuesday, the 11th of February, 1890.

The Commissioners do not bind themselves to accept the highest or any offer.

J. D. MARWICK, Town Clerk.
City Chambers, George Square, Glasgow,
Jan. 22, 1890.

BOROUGH OF WALSALL.

TO GASHOLDER MAKERS.

THE Corporation of Walsall invite TENDERS for making and erecting at their Pleck Gas-Works, in accordance with specification and Drawings prepared by Mr. John Tindall, the Gas Engineer to the Corporation, a DOUBLE-LIFT TELESCOPE GASHOLDER, the outer or lower lift to be 123 feet in diameter, and 26 feet deep, and the inner lift to be 121 feet in diameter, and 26 ft. 8 in. deep.

The specification and drawings and the conditions of contract may be seen at my Office, where forms of tender may be obtained, and any further information will be given by the Engineer, whose Office is at the Wolverhampton Street Gas-Works.

Sealed tenders, marked outside "Tender for Gasholder" are to be sent to the undersigned on or before Saturday, the 15th of February next.

The Corporation do not bind themselves to accept the lowest or any tender.

By order,
JOHN R. COOPER,
Town Clerk.

Walsall, Jan. 24, 1890.

FOR SALE—One Single Gasholder, 80 feet by 20 feet (owing to extensions at Blackpool). To be erected complete; in first-rate condition.

Apply to CLAYTON, SON, AND CO., LIMITED, Hunslet, LEEDS.

THE Gas Committee of the Leeds Corporation solicit TENDERS for the supply of FIRE-CLAY RETORTS, FIRE-BRICKS, LUMPS, and FIRE-CLAY.

Particulars as to quantity, together with forms of tender, may be obtained of Mr. Lupton, Gas Department, Municipal Offices, Leeds.

Tenders, addressed to the Chairman, at the above address, and endorsed "Tender for Fire Goods," will be received not later than Wednesday, the 19th of February next.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the supply of WET and DRY GAS-METERS, to be delivered at their Gas-Works during a period of Twelve months from receipt of order.

Each party tendering is required to send, on or before Thursday, the 6th of February next, two sample Three-Light Meters (one of which is to be unscrewed for examination), and also list of guaranteed weights of drums of all sizes, addressed to Mr. Lupton, Gas-Meter Works, Dewsbury Road, Leeds, from whom forms of tender may be obtained on application at the Offices of the Gas Department, Municipal Buildings, Leeds.

Endorsed tenders, addressed to the Chairman of the Gas Committee at the latter address, will be received not later than Wednesday, the 19th of February next.

The Committee do not bind themselves to accept the lowest or any tender.

LOCAL BOARD OF TETTENHALL.

THE Local Board of Tettenhall are prepared to receive TENDERS for the construction of MAIN and SUBSIDIARY SEWERS and WORKS for SEWAGE DISPOSAL, in accordance with the drawings and specifications of their Engineers, Messrs. H. J. and E. D. Marten, of 4, Storey's Gate, Great George Street, Westminster, S.W., and The Birches, Codsall, Wolverhampton.

Persons desirous of tendering may obtain a copy of the specifications and bill of quantities, and may inspect the drawings on application to Mr. Arthur M. Manby, the Clerk to the Board, at his Offices, No. 100, Darlington Street, Wolverhampton, on and after Thursday, Feb. 6, 1890, and on payment to him of the sum of half-a-guinea, which will not be returned.

Sealed tenders, endorsed "Tender for Sewerage Works," and addressed to Mr. Arthur M. Manby, Clerk to the Local Board of Tettenhall, No. 100, Darlington Street, Wolverhampton, to be delivered not later than Three o'clock, on the Afternoon of Wednesday, the 12th of March, 1890.

The Board do not bind themselves to accept the lowest or any tender.

By order,
ARTHUR M. MANBY,
Clerk to the Board.

The Local Board of Tettenhall,
Tettenhall, Staffordshire.

MANCHESTER CORPORATION GAS-WORKS.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the purchase and removal of the GAS TAR to be produced at their several stations, during a period of One, Two, or Three years, commencing as follows, viz.:—

Bradford Road Station, from Noon on the 31st of March, 1890.
Rochdale Road Station, from Noon on the 24th of June, 1890.
Gaythorn Station, from Noon on the 1st of August, 1890.

The Committee do not bind themselves to accept the highest or any tender, and reserve the right to divide the tenders as they may consider advisable.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Tar," must be delivered at the Offices of the Gas Department, Town Hall, on or before Thursday, the 13th of February next.

Forms of tender and other particulars may be obtained on application in writing to Mr. Charles Nickson, Superintendent of the Department.

By order of the Gas Committee,
WM. HENRY TALBOT, Town Clerk.

Town Hall, Manchester, Jan. 17, 1890.

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BY
THOMAS NEWBIGGING,
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TO SULPHURIC ACID MAKERS.

THE Gas Committee of the Leigh Local Board invite TENDERS for the supply of about 100 tons of SULPHURIC ACID during the next Twelve months.

Particulars may be obtained from the undersigned.

Sealed Tenders, endorsed "Sulphuric Acid," and addressed to Mr. Alderman Thorp, Chairman, to be delivered at the Town Hall, Leigh, not later than Monday, the 17th of February next.

ALFRED T. FLETCHER,
Engineer and Manager.

Gas-Works, Leigh, Lancs.,
Jan. 22, 1890.

LANCASTER CORPORATION.

THE Gas Committee of the Lancaster Corporation invite TENDERS for the supply of about 1600 yards of 4-inch CAST-IRON GAS-MAINS, turned and bored joints, cast vertically in dry sand, with socket end downwards, and spigot end cut off in lathe; each pipe to weigh 1 cwt. 2 qrs., coated, tested, and in 9-feet lengths.

Sealed tenders, endorsed "Tender for Mains," to state price per ton on rails at Lancaster, to be sent, on or before the 15th prox., to Thomas Swainson, Esq., Town Clerk, Lancaster.

C. ARMITAGE, Manager.

Gas-Works, Lancaster,
Jan. 21, 1890.

COMBINED ENGINE AND EXHAUSTER.

THE Widnes Local Board are prepared to receive TENDERS for the supply of a COMBINED ENGINE and EXHAUSTER; the Exhauster to be of the Rotary Type, with a capacity of 40,000 cubic feet per hour.

Conditions of contract and other particulars may be obtained upon application to Mr. Carr, Gas-Works, Widnes.

Tenders to be endorsed "Engine," and to be delivered to the undersigned before noon on Monday, the 3rd of February.

The Board do not bind themselves to accept the lowest or any tender.

JAS. T. ALLEN, Clerk.

Town Hall, Widnes, Jan. 15, 1890.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that the Ordi. NARY GENERAL MEETING of the Proprietors of the above Company will be held at the Company's Offices, North Street, Wandsworth, on Thursday, the 20th of February next, at Five o'clock in the Evening, precisely, for the purpose of the declaration of a Dividend, the election of Directors and Auditors, and the transaction of the General Business of the Company.

The Transfer Books will be closed from the 7th to the 20th of February, both days inclusive.

By order of the Board,
WALTER CROMARTY, Secretary.

98, North Street, Wandsworth, S.W.,
Jan. 22, 1890.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that a Half- YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at this Office on Friday, the 7th day of February next, at Twelve o'clock (noon) precisely, to transact the usual business, including the declaration of a Dividend for the Half Year ending the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such Meeting go out of Office, in compliance with the Company's Acts or Schemes of Amalgamation.

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

The Gaslight and Coke Company,
Chief Office: Horseferry Road,
Westminster, S.W., Jan. 22, 1890.

Price 2s. per dozen, or 10s 6d. per 100, post free.

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Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

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MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

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Member of the Society of Public Analysts and of the Committee of the London Section of the Society of Chemical Industry.

Chemist and Superintending Gas Examiner to the London County Council.

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Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

Newland Gas Coal

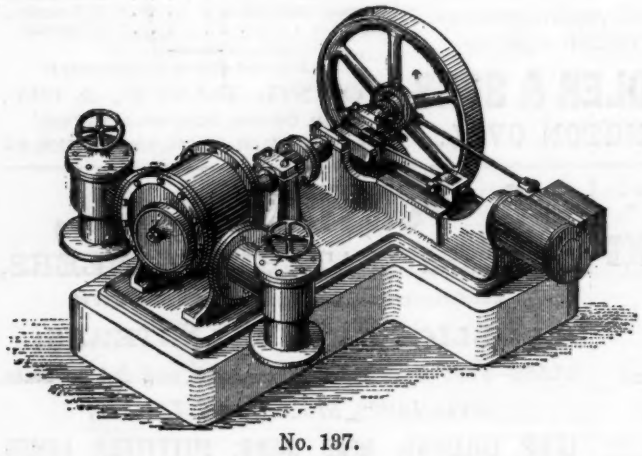
For particulars, apply to

LOCKE & CO.,
NORMANTON,
YORKSHIRE.

G. WALLER & Co.'s NEW PATENT GAS EXHAUSTER.
MADE WITH 4, 3, OR 2 BLADES.

In use at, or on order for, over 120 *Works, equal to* 6,840,000 *Cubic Feet per Hour.*

Oldest Makers of Beale Exhausters for over 300 Works and 25,600,000 cubic feet per hou
1,000 to 250,000 CUBIC FEET PER HOUR WITH OR WITHOUT ENGINE COMBINED.



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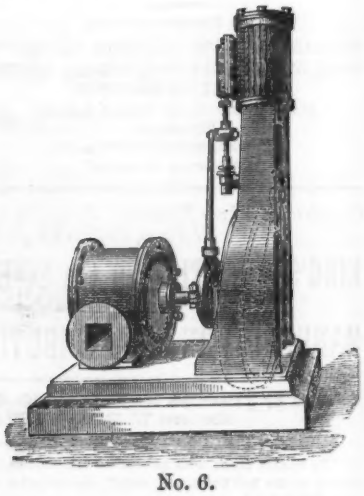

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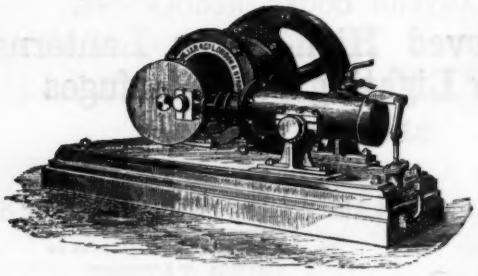


No. 5.

No. 137.—Horizontal Combined Engine and Exhauster.
No. 6.—Vertical ,, for small space.
No. 5.—Oscillating ,, for small works.

BYE-PASS VALVES.
Disc, Rack, and Screw Valves, Compensating Governors
(For Steam Throttle Valves),
Tar, Lquor, and Water Pumps, Hydraulic Main Valves,
Coke-Breaking Machines.

SEE PREVIOUS ADVERTISEMENTS. ILLUSTRATED CATALOGUE ON APPLICATION.

Phœnix Engineering Works, Park Street, Southwark, London, S.E.,
NEAR SOUTHWARK BRIDGE (FOUR MINUTES FROM HOLLAND STREET), AND AT
STROUD, GLOUCESTERSHIRE.

GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

FACE YOUR RETORT MOUTHPIECES.

JOHN RUSCOE calls attention to his Retort Mouthpiece and Lid Facing Machines, which are in extensive use; also to his Lathes, Drilling, Slotting, Grooving, and Planing Machines, Smiths' Hearths, Smithy Fans, Roots' Blowers; also special Screwing Machines for Gas Tubes and Bolts, Taps, Wrenches, Pipe Cutters, special Taper and Twisted Rymers, Drills, &c.

PATENT TWISTED TAPS, DIES, & CUTTERS.

Thousands in constant work, give universal satisfaction.

Work Easier, Less Friction, Last Longer, and do Better Work than straight Grooves.

Main Drilling Stand, with Cup Drills, 1¼ to 6 inch; Taps, Rymers, and Drills.

Ratchet Screwing Stocks, and Adjustable Once-up Stocks, Dies, Guides, &c.

Inquiries and Trial Orders Solicited. Everything Guaranteed. Apply to

JOHN RUSCOE, Albion Works, Hyde, near Manchester.

HANNA, DONALD, & WILSON,

(ESTABLISHED 1851)

GAS ENGINEERS & CONTRACTORS
FOR THE
ERECTION OF GAS AND WATER WORKS,
TELESCOPIC AND SINGLE-LIFT GASHOLDERS,
CAST AND WROUGHT IRON GASHOLDER-TANKS,
IMPROVED FIXED OR TRAVELLING HYDRAULIC PURIFIER-COVER LIFTERS,
PURIFIERS, CONDENSERS, SCRUBBERS, EXHAUSTERS, AND PUMPING-ENGINES,
TAR AND LIQUOR PUMPS, HYDRAULIC SLUICE AND SLIDE VALVES, LAMP-POSTS AND HYDRANTS COMBINED.

DESIGNS AND ESTIMATES SUPPLIED ON APPLICATION.

LONDON OFFICE: 9, FENCHURCH STREET, E.C.
ABERCORN FOUNDRY & ABBEY WORKS, PAISLEY, N.B.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF
IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES
FOR ANY PURPOSE.

SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR
DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

PURE WHITE & PERFECTLY STEADY LIGHT,
NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).
Can be fixed in a few minutes.

May be seen at the Offices of the
SCHÜLKE GAS-LAMP Co.
LIMITED,
Room 446—11, QUEEN VICTORIA STREET,
LONDON, E.C.,
Where Price Lists and full particulars may be obtained.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

LONDON OFFICE, 60, QUEEN VICTORIA ST., E.C.

CLAYTON SON & Co. LIMITED, LEEDS.

MAKE

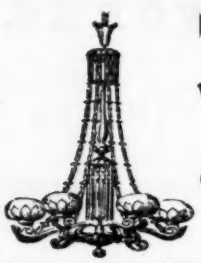
RETORT LIDS

OF ALL FORMS & SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

F. & C. OSLER,

(ESTABLISHED 1807)



MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES,

TABLE GLASS OF ALL KINDS,

CHANDELIERS IN BRONZE AND ORMOLU.

MODERATOR LAMPS.

100, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS,

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP,

Westphal's Patent.

Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

Particulars and Prices Free.

HENRY GREENE & SONS,

SOLE CONSIGNEES FOR GREAT BRITAIN & COLONIES,

153 TO 155, CANNON STREET, LONDON BRIDGE, E.C.

R. DEMPSTER & SONS, Ltd.,

ESTABLISHED 1855.

ROSE MOUNT GAS ENGINEERING WORKS.

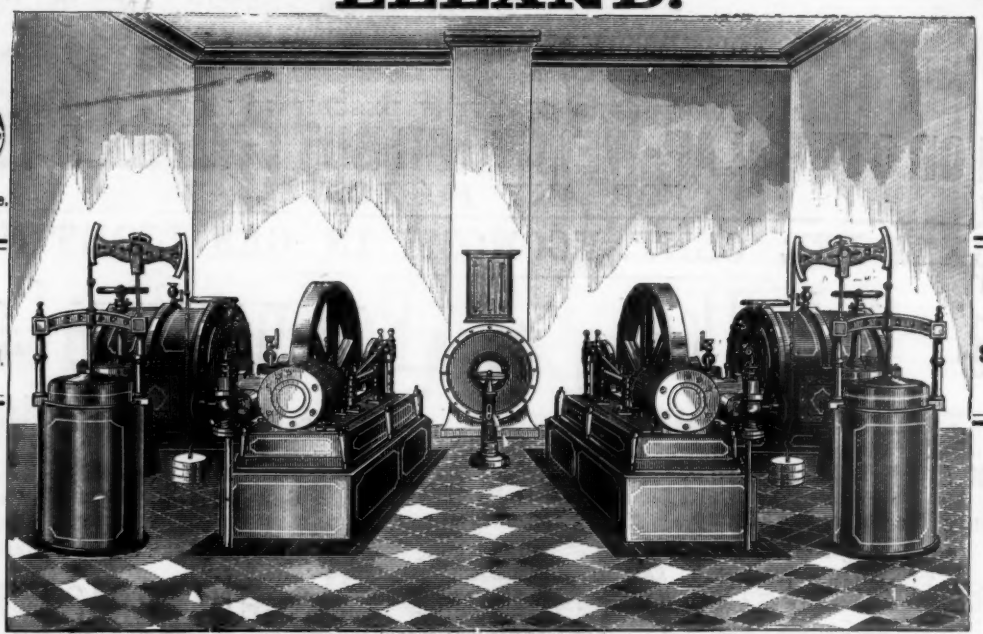
ELLAND.

No. 1. Flange Valve.

NO SLIP.

NO OSCILLATION.

No. 3. Screw Valve.



No. 5. Screw Valve.

NO HIGH SPEED.

STEADY GAUGE.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

DEMPSTERS', ELLAND.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
ADDYSTON PIPE AND STEEL COMPANY, Cincinnati.

Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected ncluding a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,

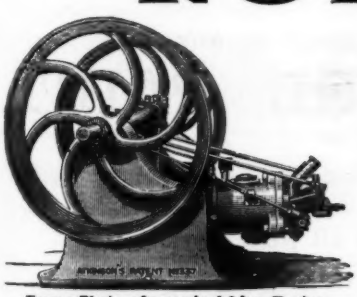
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

MANLOVE, ALLIOTT, & CO., LTD.,

ENGINEERS,

NOTTINGHAM,

LONDON, MANCHESTER, AND GLASGOW.



From a Photo. of a nominal 6-h.p. Engine.

ATKINSON'S "CYCLE" PATENT

GAS-ENGINE.

The simplest and most economical Gas-Engine made.

THE BEST ENGINE FOR ELECTRIC LIGHT.

Consumes less Gas per brake horse power than any other Gas-Engine.

TELEGRAPHIC ADDRESS: "MANLOVES NOTTINGHAM."

SPECIALITIES.

THE "NUGENT" RECUPERATIVE RETORT SETTINGS and FURNACES.

"ROBUS" IMPROVED RETORT SETTINGS, with COKE, TAR, and BREEZE FURNACES.

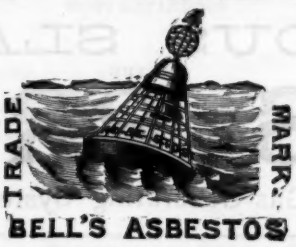
THE ABOVE SETTINGS & FURNACES ARE PROVING EMINENTLY SATISFACTORY.

Every Particular, with Estimates, forwarded upon Application to

MESSRS. J. & H. ROBUS,

CONTRACTORS FOR THE ERECTION OF GAS & WATER WORKS,
20, BUCKLERSBURY, LONDON, E.C.

BELL'S ASBESTOS AQUOL PAINT



IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY 40 PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

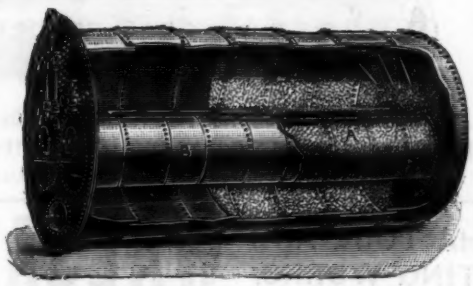
BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

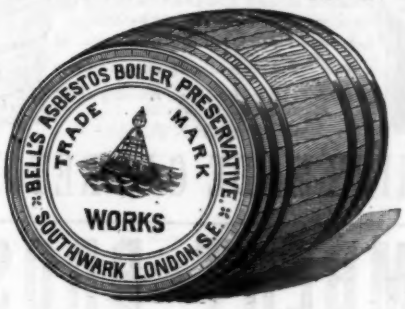
DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. CARDIFF: West Bute Street. BIRMINGHAM: 7, John Bright Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN, BARCELONA, and ANTWERP.

BELL'S ASBESTOS BOILER PRESERVATIVE

Will remove Incrustation from Steam-Boilers of all kinds without chipping.



A shows Boiler Plates when incrusted.
B shows Boiler Plates when cleaned by this Composition.



Every Cask is sent out as above.

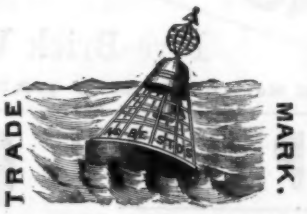
The action of this **BOILER PRESERVATIVE,** by absorbing the free oxygen that is in the water, **entirely checks pitting and corrosion.** It also disintegrates incrustation so immediately as to prevent its adhering to the plates; and the deposit falls to the bottom in a loose powder, which is easily swept out. By keeping boilers clean, a **great economy of fuel is effected,** and the danger of the plates burning is entirely obviated; thus avoiding the great risks which are inseparable from scaled plates, lengthening the life of a boiler, and **covering its own cost a hundredfold.** Whenever possible it should be used through Feed Pump or Injector, which it will also keep clear from incrustation. The small quantity required to effect its purpose makes this the most economical, and more than repays the higher price we charge for a fluid which, in the case of many other makers, is useless.

QUANTITY REQUIRED—A quarter of a pint weekly per horse power indicated; where the water is very bad rather more, or one pint for every 700 gallons of water evaporated.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.

MANCHESTER: Cable St., Blackfriars.
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
DUBLIN, BERLIN.



DEPÔTS.

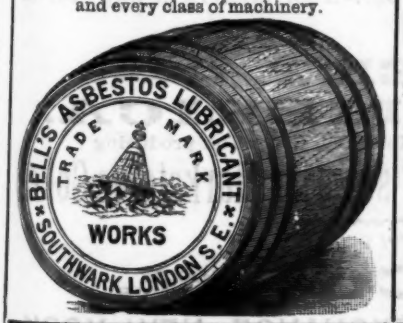
BIRMINGHAM: 7, John Bright Street.
GLASGOW: 35, Robertson Street.
CARDIFF: West Bute Street.
BARCELONA, and ANTWERP.

SOUTHWARK, BELL'S ASBESTOS. **LONDON, S.E.**

BELLS ASBESTOS
YARN AND SOAPSTONE PACKING
Is the BEST LOCOMOTIVE PACKING made.

BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



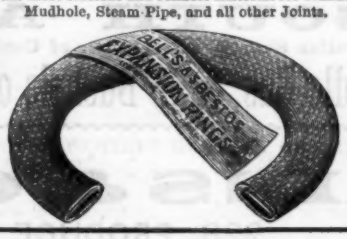
BELL'S ASBESTOLINE
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

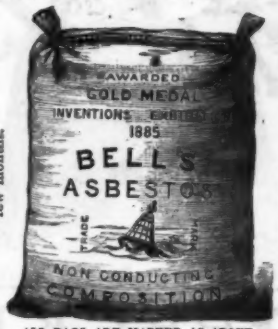
ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELLS ASBESTOS
EXPANSION SHEETING
RINGS, AND TAPE.
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



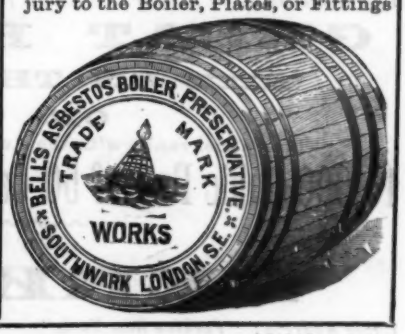
BELL'S ASBESTOS
NON-CONDUCTING COMPOSITION.
Will reduce loss by radiation, and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



Can be applied again after many years' service. Is sent out dry in bags: therefore cheaper than others sent on wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings



WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

LAMBERT BROS. ALPHA TUBE AND FITTING WORKS, WALSALL

MANUFACTURERS OF WROUGHT-IRON TUBES AND FITTINGS, BRASS GAS-FITTINGS, GAS-VALVES, STEAM AND WATER VALVES, &c.,
And of WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: T. LAMBERT & SONS, SHORT STREET, LAMBETH, S.E.

FIRE BRICKS,
LUMPS, TILES,
BLOCKS, &c.
Special Bricks for Intense Heats.

GAS RETORTS.

CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

MOBBERLEY & PERRY,

Fire-Brick Works, STOURBRIDGE.

☞ Retort Setters sent to any part of the Kingdom.

THE "CAMPBELL" GAS-ENGINE.

Type of 10-HP. Engine Nominal. 25-HP. Indicated.

GREAT SUCCESS.

20 PER CENT. CHEAPER THAN ANY OTHER.
Gives the Highest Satisfaction with all kinds of Work.

Testimonial from Mr. JAMES MOON, Engineer to the Filey Gas-Works.
Feb. 9, 1889.

GENTLEMEN,—We have been using one of your Gas-Engines on our Works for about four months, and I have pleasure in saying that it does its work in a very satisfactory manner. The engine is half-horse power, steady in all its movements, and, with ordinary care, will drive the exhaust apparatus at an even gauge.—I remain, Yours respectfully,
(Signed) JAMES MOON.

For Price Lists and full particulars, apply to the Sole Makers:

THE CAMPBELL GAS-ENGINE Co., LIMITED,

WELL LANE, HALIFAX, YORKS.

BRECKENRIDGE CANNEL,

OF KENTUCKY, U.S.A.

The undersigned, SOLE AGENTS for this celebrated Gas Cannel, now offer it for delivery at any port in

GREAT BRITAIN,
ON THE CONTINENT,
OR SOUTH AMERICA.

This Cannel ranks with the Australian Shale as an enricher of Coal Gas; One Gross Ton producing

15,000 Cubic Feet of 50-Candle Gas, & 26 Bushels of superior Marketable Coke.

FOR PRICES AND FURTHER PARTICULARS, APPLY TO

PERKINS & Co., SOLE AGENTS,

Cable Address: "Perkins New York."

228, PRODUCE EXCHANGE, NEW YORK.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

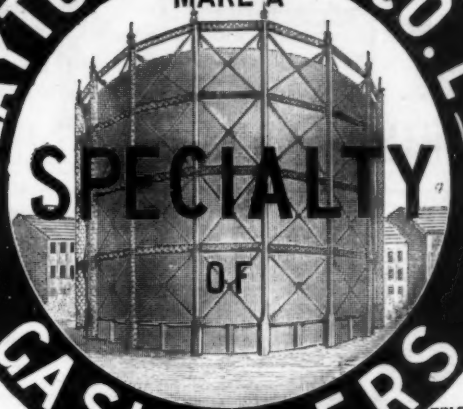
ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET,
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A



SPECIALTY OF

GASHOLDERS

AND MAKERS OF

REG? TELEGRAPHIC ADDRESS: "GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

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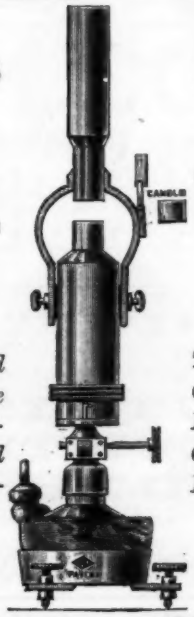

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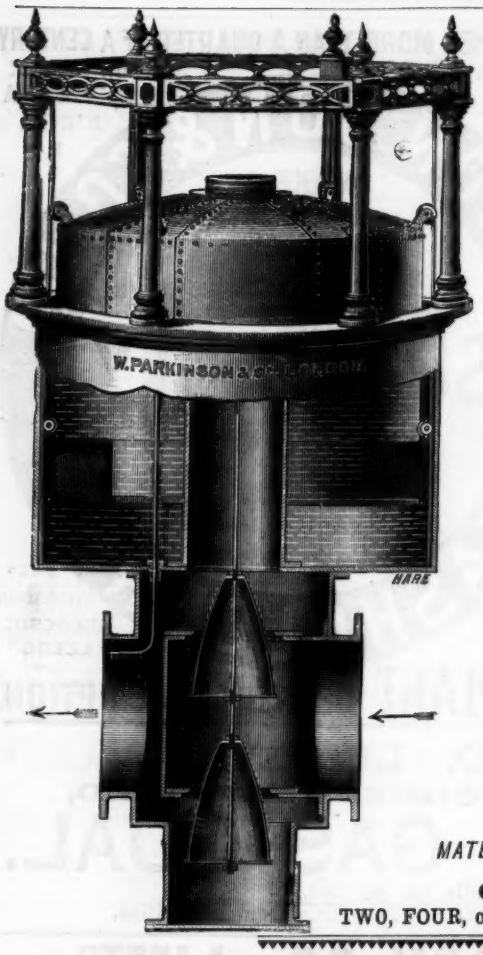

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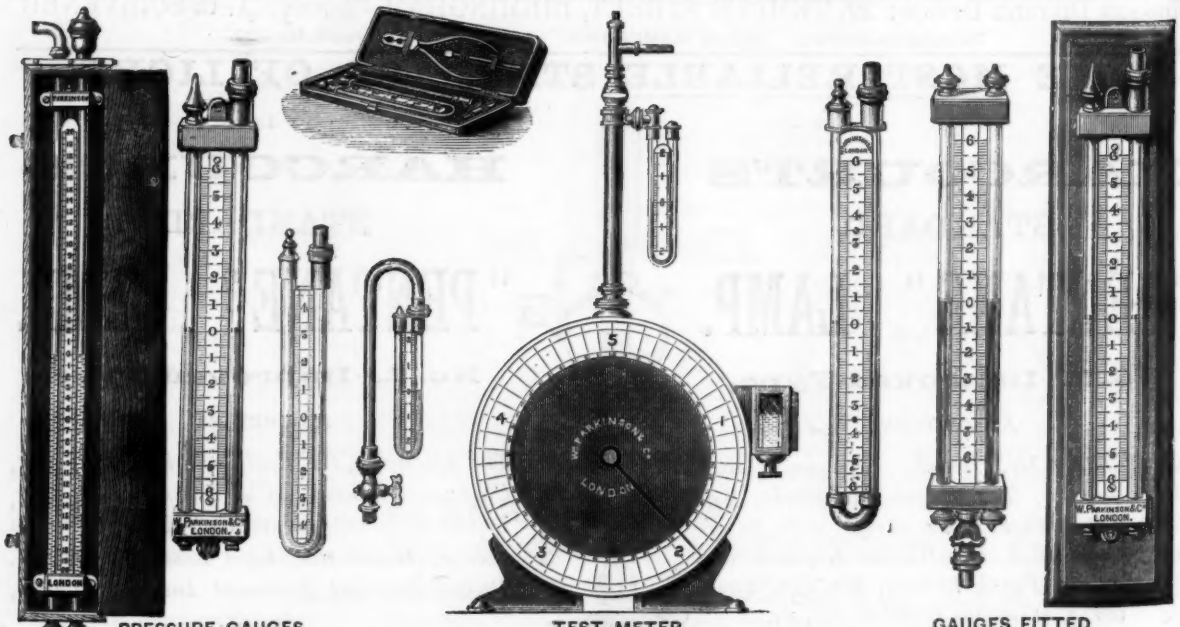

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[See also Advt., p. 140.

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